MARINE REVIEW

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No. 27

MERCHANT SHIP AND NAVAL CONSTRUCTION.

Since the 1902 ship building edition of the Marine Review was published, there has been a considerable diminution in the number of naval vessels under construction, though the program, as far as money is concerned, is heavier. A great many of the torpedo craft have been completed and accepted during the year, in which fact lies the difference. The torpedo craft Bainbridge, Barry, Chauncey, Dale, Decatur, Paul Jones, Perry, Preble, Stewart, Truxton, Whipple, Worden, De Long, Thornton and Wilkes have all passed into commission. The monitors Arkansas and Wyoming have also been accepted. The battleship Maine, built at Cramps, went into commission during the present week. A number of the submarine boats are complete in a structural sense, but none have been accepted as yet. There were only two additions to the list of vessels building for the navy during the year. These are the battleships Connecticut and Louisiana. The Louisiana is to be built by the Newport News Ship Building & Dry Dock Co., Newport News, Va., and the Connecticut by the New York navy yard. A spirited rivalry exists between this private firm of builders and the navy department. The ship building company is determined to show that it can build ships with greater speed and with less cost than t e government yards. The consequence is that the navy department is doing all that it can to further work upon the Connecticut. The outcome, however, is probably not in doubt. The Connecticut is likely to cost more and to take longer to build than the Louisiana.

Altogether there are forty-four warships under construction for the United States navy, with a total displacement of 284,943 tons, a total horse-power of 448,720, and costing for hulls and machinery $77,199,516. In addition, contracts for two armored cruisers, to be known as Tennessee and Washington, will be let during the present month.

In merchant ship work, the year has not been especially rich. This does not, of course, refer to the protected ship building industry of the lakes, which is still highly prosperous and which is dealt with on the next page. However, the seaboard ship yards have all been quite busy on work brought over from the preceding year. Not a single contract has been let for a vessel for the foreign trade of the United States. Of course the Maryland Steel Co., Sparrow's Point, Md., has under way two vessels for the Atlantic Transport Line, and the New York Ship Building Co., Camden, N. J., four vessels for this same line, but these contracts are of two years' standing. It is a significant fact that since these contracts were let for vessels for the foreign service, no new ones have been received. The Maryland Steel Co. delivered during the year the steamships Shawmut and Tremont to the Boston Steamship Co. These vessels are part of a fleet of five which ply in the Pacific trade between Tacoma, Seattle and the orient. The novelty of the year was the construction of a seven-masted steel schooner at the works of the Fore River Ship & Engine Co., Quincy, Mass. A few contracts have been received by the coast ship yards for some splendid vessels for the coastwise service. These include a sidewheel passenger steamer and a freight steamer for the Fall River Line, the former to cost $1,000,000 and the latter $450,000, and both to be built by the Fore River Ship & Engine Co., Quincy, Mass.; a 400-ft. passenger and freight steamer for the Mallory Line of New York, and a similar vessel for the Ocean Steamship Co. of Savannah, both to be built at the Roach Ship Yard, Chester, Pa.; a 300-ft. steamer for the Clyde Line, to be built at Cramps, Philadelphia; a new steamer for the Eastern Steamship Co., to be about 350 ft. long, and two steamers for the Ericsson Line, each 203 ft. long, all to be built at the Harlan & Hollingsworth Co.'s Works, Wilmington, Del. These include all that are of importance.

VESSELS UNDER CONSTRUCTION FOR THE UNITED STATES NAVY.

Name of vessel.	Where and by whom building.	Probable date of completion.	Dimensions. L'th L. W. L.	Beam.	Mean dra'ght.	Displacement tons.	Indicated horse power	Contract speed, knots.	Type of engine.	Type of boilers	Contract price exclusive of armor and armament.
Battleships.											
Maine	Cramp & Sons, Philadelphia	June, 1901	388	72.2	23.6	12,300	16,000	18	Twin-screw, trip. exp	24 Niclausse	$2,885,000
Missouri	Newport News Works, Virginia	Feb., 1902	388	72.2	23.6	12,230	16,000	18	Twin-screw, trip. exp	12 Thornycroft	2,885,000
Ohio	Union Iron Works, San Francisco	Mar., 1902	388	72.2	23.6	12,440	16,000	18	Twin-screw, trip. exp	12 Thornycroft	2,899,000
Nebraska	Moran Bros. Co., Seattle	June, 1904	435	76.10	24	15,320	19 000	19	Twin-screw, trip. exp	24 Bab. & Will.	3,723 600
Virginia	Newport News Works, Virginia	June, 1904	435	76 10	24	15.320	19 000	19	Twin-screw, trip. exp	24 Bab. & Will.	3,590,000
Georgia	Bath Iron Works, Bath, Me	June, 1904	435	76.10	24	15,320	19,000	19	Twin-screw. trip. exp	24 Bab. & Will.	3,590,000
New Jersey	Fore River Co., Quincy, Mass	June, 1904	435	76 2	24	14,600	19,000	19	Twin-screw, trip. exp	24 Bab. & Will.	3,405,000
Rhode Island	Fore River Co., Quincy, Mass	June, 1904	435	76.2	24	14 600	19,600	19	Twin-screw, trip. exp	24 Bab. & Will.	3,405,000
Connecticut	U. S. Navy Yard, New York	Feb., 1906	450	76.9	24.5	16,000	16.500	18	Four-cyl., trip. exp	12 Bab. & Will.	4,212.000
Louisiana	Newport News Works, Virginia	Mar., 1906	450	76.9	24.5	16,000	16,500	18	Four-cyl., trip exp	12 Bab. & Will.	3,990,000
Armored Cruisers.											
Pennsylvania	Cramp & Sons, Philadelphia	June, 1904	502	70	24.6	13,800	23,000	22	Twin-screw, trip. exp	30 water tube	3,890,000
Colorado	Cramp & Sons, Philadelphia	June, 1904	502	69.6	24.6	13,400	23,0 0	22	Twin-screw, trip. exp	30 water tube	3,730,000
California	Union Iron Works, San Francisco	June, 1904	502	70	24.6	13,800	23.000	22	Twin-screw, trip. exp	30 water tube	3 800 000
South Dakota	Union Iron Works, San Francisco	June, 1904	502	69.6	24.6	13 400	23,000	22	Twin-screw, trip. exp	30 water tube	3,750,000
West Virginia	Newport News Works, Virginia	June, 1904	502	70	24.6	13,800	23,000	22	Twin-screw, trip. exp	30 water tube	3,885,000
Maryland	Newport News Works, Virginia	June, 1904	502	69.6	24.6	13,400	23,000	22	Twin-screw, trip. exp	30 water tube	3,775,000
Protected Cruisers.											
St. Louis	Neafie & Levy, Philadelphia	June, 1904	424	66	23.6	10 000	21,000	22	Twin-screw, trip. exp	16 water tube	2 740.000
Milwaukee	Bath Iron Works, Bath Me	June, 1904	424	66	23.6	10,000	21.000	22	Twin-screw, trip. exp	16 water tube	2,750.000
Charleston	Newport News Works, Virginia	June, 1904	424	66	23.6	10,000	21,000	22	Twin-screw, trip. exp	16 water tube	2 741,000
Monitors.											
Nevada	Bath Iron Works, Bath Me	Mar., 1901	252	50	12.6	3,235	2,400	11.5	Twin-screw, trip. exp	4 Niclausse	962,000
Florida	Lewis Nixon, Elizabeth, N. J	Apr., 1901	252	50	12.6	3.235	2 400	11.5	Twin-screw, trip. exp	4 Mosher	925,000
2nd Class Cruisers.											
Denver	Neafie & Levy, Philadelphia	July, 1902	292	44	15.9	3,200	4,700	16.5	Twin-screw, trip. exp	6 water tube	1,080.000
Galveston	Wm. R. Trigg Co., Richmond	Jan., 1902	292	44	15.9	3 200	4 700	16.5	Twin-screw, trip. exp	6 water tube	1 027 000
Chattanooga	Lewis Nixon, Elizabeth, N J	July, 1902	292	44	15.9	3 200	4,700	16.5	Twin-screw, trip. exp	6 water tube	1.039 966
Cleveland	Bath Iron Works, Bath, Me	July, 1902	292	44	15.9	3,200	4,700	16.5	Twin-screw, trip. exp	6 water tube	1,041.650
Tacoma	Union Iron Works, San Francisco	Apr., 1902	292	44	15.9	3,200	4,700	16 5	Twin-screw, trip. exp	6 water tube	1,041,900
Des Moines	Fore River Co., Quincy, Mass	July 1902	292	44	15.9	3.200	4,700	16.5	Twin-screw, trip. exp	6 water tube	1,065,000
Torpedo Craft.											
Hopkins	Harlan & Hollings., Wilmington	Apr , 1901	244	24.6	6.0	408	7.200	29	Twin screw, trip. exp	4 Thornycroft	291 000
Hull	Harlan & Hollings., Wilmington	Apr., 1901	244	24.6	6.0	408	7,200	29	Twin-screw, trip. exp	4 Thornycroft	291,000
Lawrence	Fore River Co., Quincy, Mass.	Dec., 1900	242	22.3	6.2	400	8,400	30	Twin-screw trip. exp	4 water tube	281,000
Macdonough	Fore River Co., Quincy, Mass	Dec., 1900	242	22.3	6 2	400	8 400	30	Twin-screw, trip. exp	4 water tube	281,000
Goldsborough	Wolff & Zwicker, Portland, Ore.	Dec., 1900	195	20.5	5	247	6,000	30	Twin-screw, trip. exp	3 Thornycroft	214,000
Stringham	Harlan & Hollings. Wilmington	Dec., 1900	225	22	6.6	340	7.200	30	Twin-screw trip. exp	4 Thronycroft	236 000
Blakely	Geo. Lawley & Sons, S. Boston	Jan., 1901	175	17.6	4.8	165	3,000	26	Twin-screw, trip. exp	3 Normand	159 400
Nicholson	Lewis Nixon, Elizabeth, N. J	Jan., 1901	175	17	4.6	174	3,000	26	Twin-s rew. trip. exp	3 water tube	165 000
O'Brien	Lewis Nixon, Elizabeth N. J	Jan., 1901	175	17	4 6	174	3,000	26	Twin-screw, trip. exp	3 water tube	165 000
Tingey	Columbian Iron Works, Baltimore	Jan., 1901	175	17.6	4.8	165	3,000	26	Twin-screw, trip. exp	3 Thornycroft	168,000
Submarine Boats.											
Plunger	Wm. R. Trigg Co., Richmond	Not set	85.3	11.6	.....	168	.....	.....	Single-Screw Otto gas	.....	150,000
Adder	Lewis Nixon, Elizabeth, N. J	Apr., 1901	63.4	11.9	.....	120	160	8	Single-screw, 4-cyl. Otto	Gasoline tank	170,000
Grampus	Union Iron Works, San Francisco	Apr., 1901	63.4	11.9	.....	120	160	8	Single-screw 4-cyl. Otto	Gasoline tank	170,000
Holland	Lewis Nixon, Elizabeth, N. J	Apr., 1901	53.11	10 3	.....	74	45	8	Single-screw, Otto gas	Gasoline tank	150 000
Mocassin	Lewis Nixon, Elizabeth, N. J	May, 1901	63.4	11.9	...	120	160	8	Single-screw, 4-cyl. Otto	Gasoline tank	170,000
Pike	Union Iron Works, San Francisco	May, 1901	63 4	11.9		120	160	8	Single-screw, 4-cyl. Otto	Gasoline tank	170,000
Porpoise	Lewis Nixon, Elizabeth, N. J	June, 1901	63.4	11 9	....	120	160	8	Single-screw, 4-cyl. Otto	Gasoline tank	170.000
Shark	Lewis Nixon, Elizabeth, N. J	July, 1901	63.4	11.9	....	120	160	8	Single-screw, 4-cyl. Otto	Gasoline tank	170,000
						284,943	448 720				$77,199,516

MARINE REVIEW

SHIP BUILDING EDITION

1903

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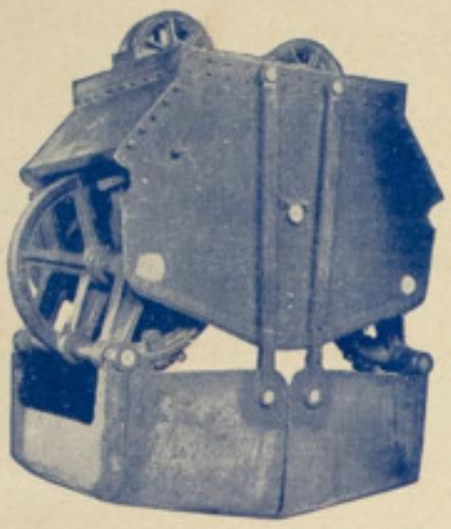

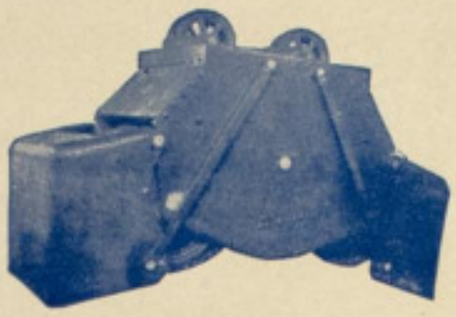

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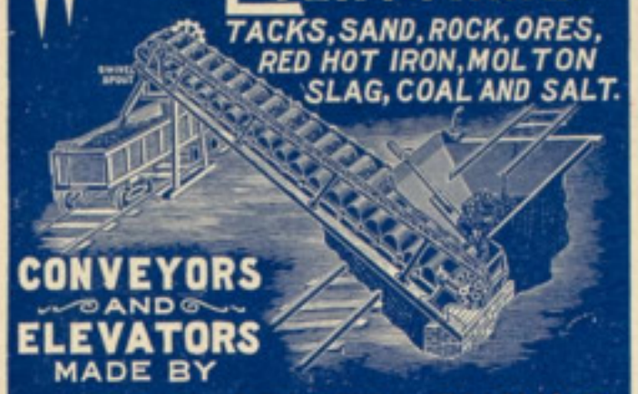

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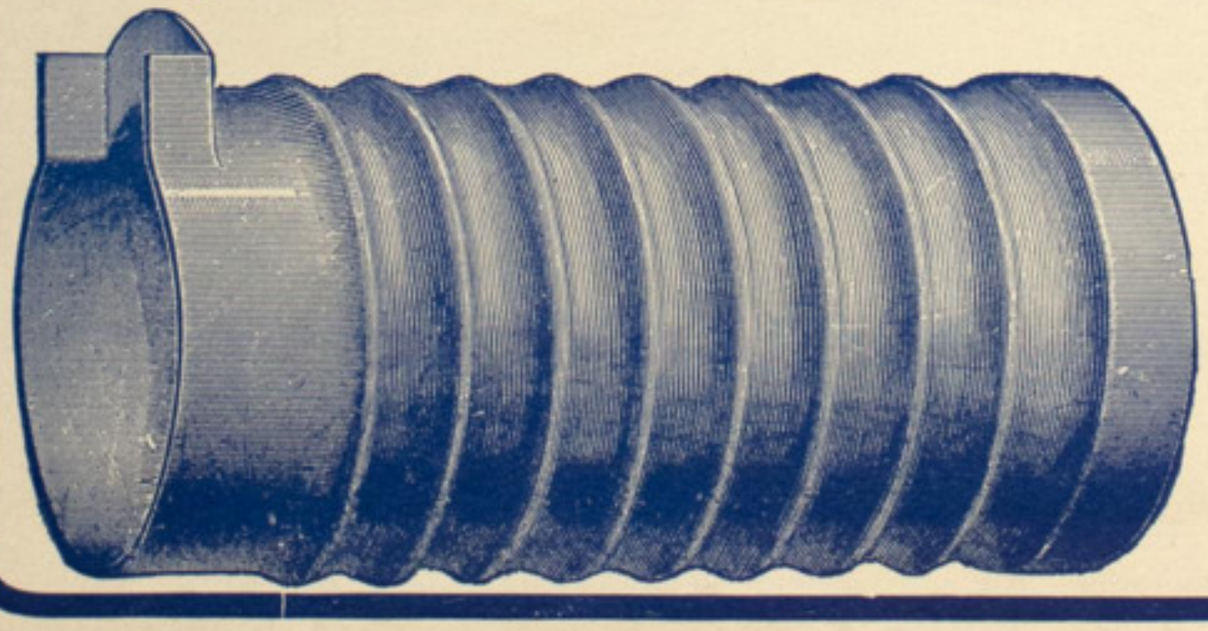

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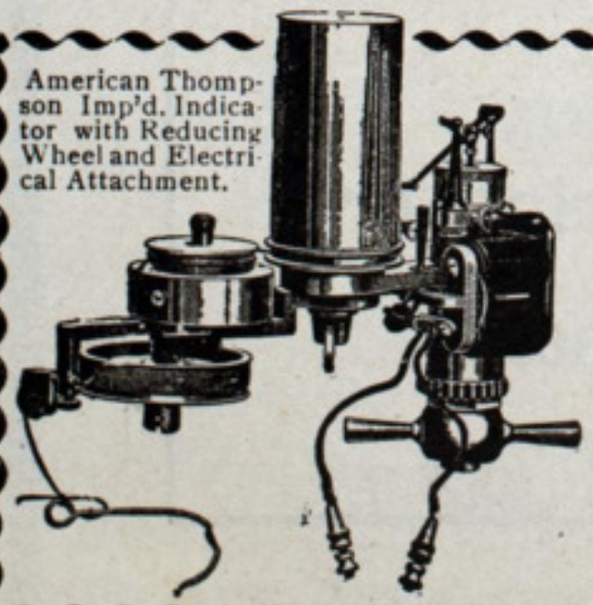
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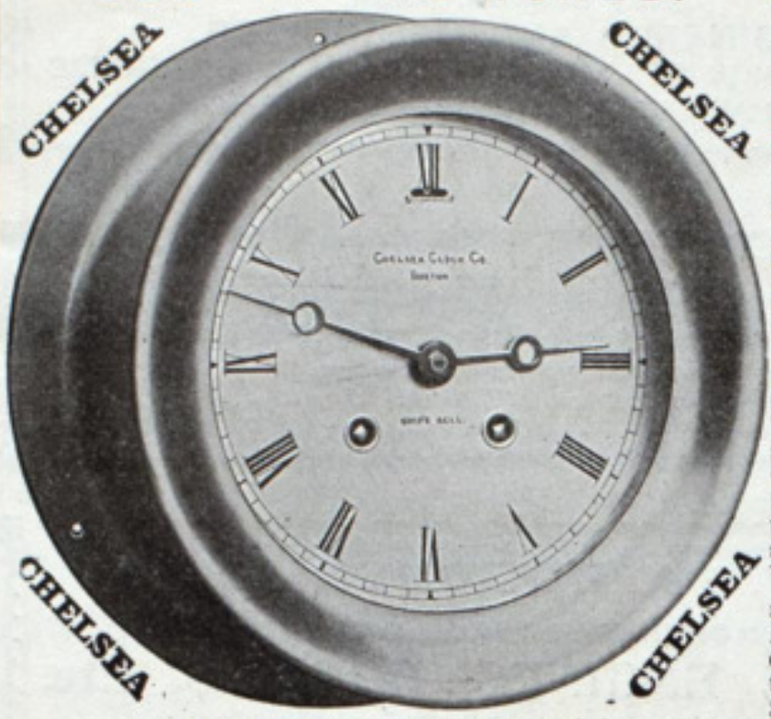

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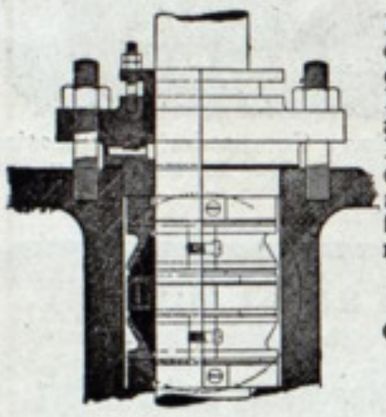

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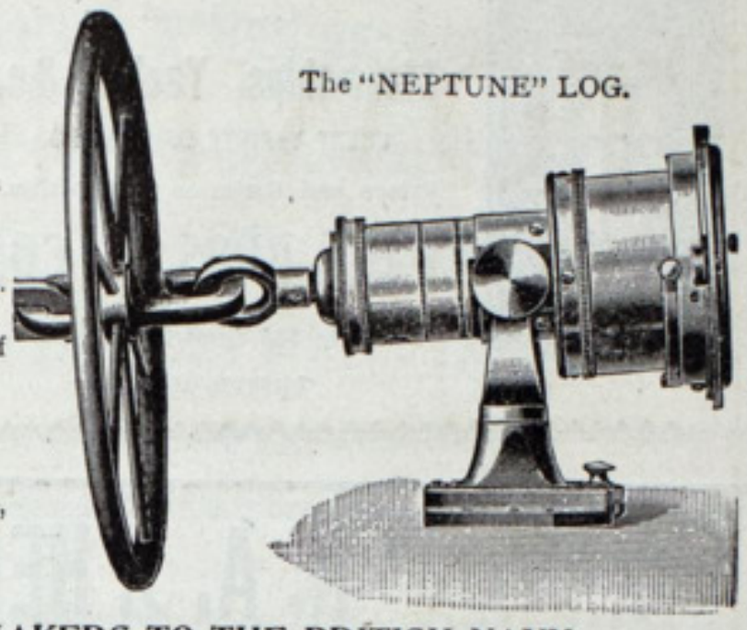

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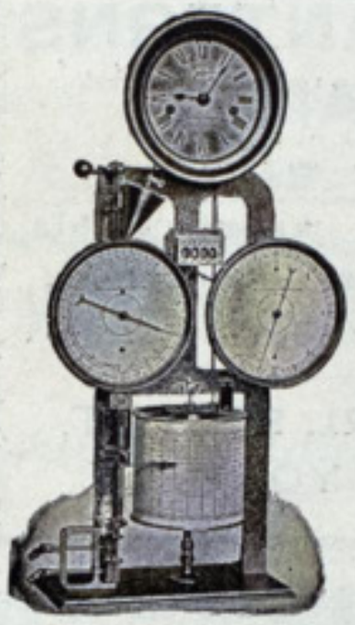

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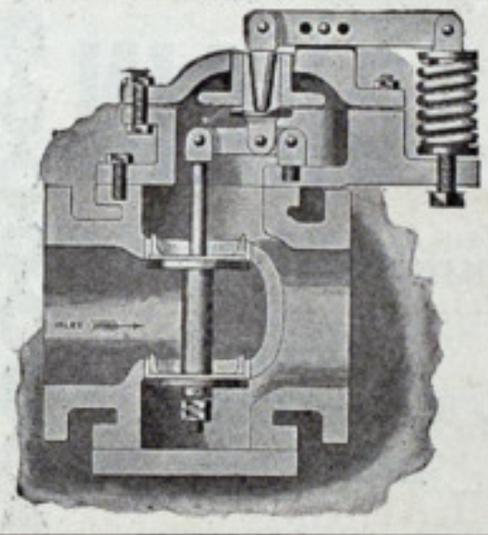

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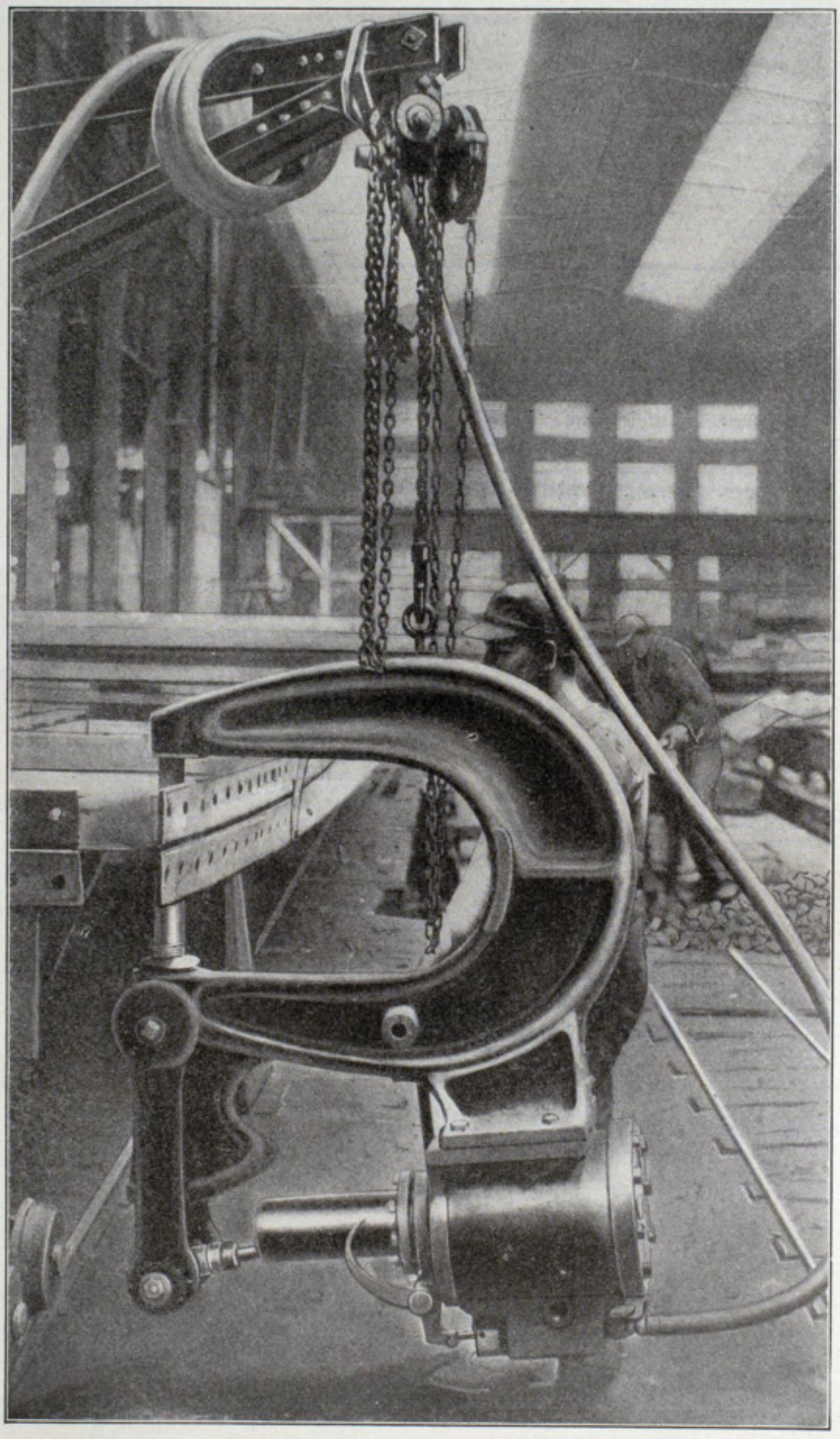

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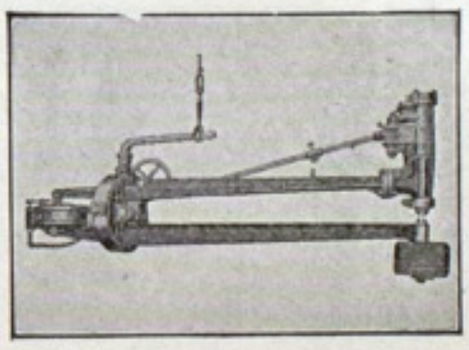

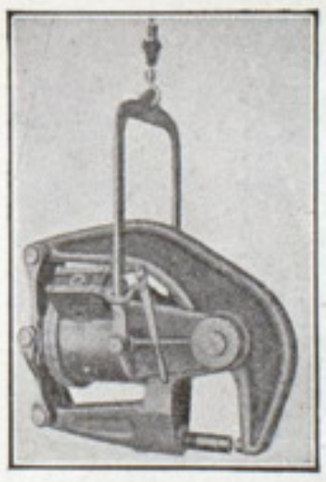

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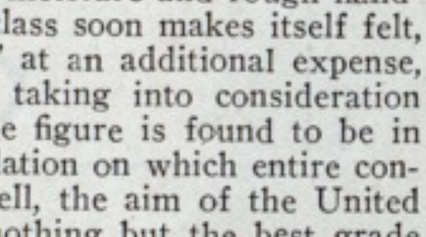
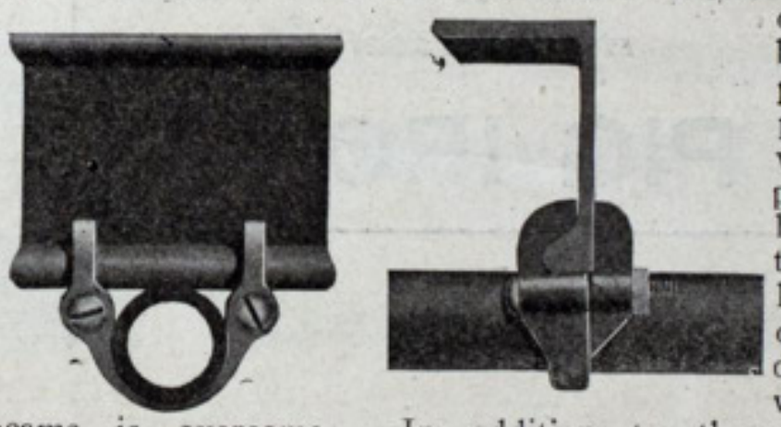
Special attention is called to combination lamp fixture, switch and junction box, absolutely watertight. This is an innovation in watertight fixtures, and when the fact is taken into consideration that the same fixture can be used as a junction box, lamp, receptacle with fuse, and as a switch without altering same in any manner, plants with these fittings must be acknowledged superior to those not equipped with same.

Attention is next called to patent watertight coupler for making wiped joint connections with lead cable. When properly applied and screwed to junction box or lamp fitting, the same is watertight in every sense of the word, for the wiped joint connection is a part of the cable and coupler at the same time. The last installations of these have been at Fort Caswell, Wilmington, N. C., Fort Adams and Fort Greble at Newport, R. I., and Fort Phillip, New Orleans, the latter installation now under way, and they have been thoroughly endorsed by all who have had occasion to use or authorize the use of same. These couplers are made of bronze in iron pipe sizes from ¾ in. up to take any size of lead cable. The public will recognize in this article something for which there has been a long unsupplied demand.



Another article which is entirely new is a watertight junction box, in nearly all styles of combinations, with a fuse holder constructed to take a standard glass protected fuse as used by the United States Navy. By inserting fuse in holder and screwing same to box in the same manner as watertight attachment plugs are secured to similar boxes, current will flow through same. The circuit is open until fuse is inserted vertically, which operation throws the fuse into circuit. The act of withdrawing same breaks the circuit. The advantage of a fuse of this type over the styles in use where a fuse is used, which happens in a few cases, is that the operation of fusing or refusing a circuit is so easily accomplished that the objections to having fuses in junction boxes of the watertight type is overcome and quite an item of expense in cost of material and installation is done away with. It is now possible to have watertight lamp fixtures arranged with both a fuse and a switch as part of the fixture itself, and in addition to these features the fitting can, if desired, be used as a junction cut-out, to branch to other fixtures. An improvement of this kind does much to further the cause of electrical illumination for high-grade installations, most economical in the end. Conduit fixtures are made for waterproof work with or without a switch and are constructed in a most substantial manner, using a globe and guard only 6 in. over all, making the actual size about 7½ in. When the switch is used the only change in appearance of fixture is the projection of the handle extending about 2 in. (including stuffing box) over top, parallel with entering pipe line feeding lamp. These fixtures can be arranged for single-pole fuses if desired and possess the same features contained in our combination box and fixture, with the exception of acting as a junction cut-out.

Conduit hangers are made in great variety and for all sizes pipe and styles of beams, singly and in gangs. This permits of a pipe line being suspended in places where it would be impossible to drill beams, and in the case of large pipe the objection to drilling and weakening beams is overcome. In addition to these features the work of hanging pipe can be accomplished much quicker and the line can also be shifted at any time without additional expense if necessary to find space for other piping. This type of hanger is being installed on the United States cruisers Denver, Des Moines, Galveston, United States battleships New Jersey and Rhode Island and torpedo boat destroyers Lawrence and Macdonough. Watertight bells for exposed places are also manufactured in all sizes. It is so rarely that beds are actually produced perfectly constructed to exclude all moisture that particular attention is called to them, and it is desired that supply houses and contractors communicate with us when it is necessary to purchase this class of material. Special fixtures and castings of all kinds for fortification work are constantly being turned out, and as this work is of so varied a character we have no hesitancy in saying that any orders in this line can be taken care of as promptly and satisfactorily as can possibly be done. Watertight annunciators, both navy standard and marine types, can be supplied in any style of finish and any number of drops.



There is no limit to cause the company to decline figuring on any installation whatsoever or to hinder the proper completion of contracts, which point should be taken into consideration, as the proper completion of contracts is guaranteed beyond a doubt. In many cases serious troubles are caused by inability of contractors to furnish the necessary experienced labor and proper materials to allow them to keep even with other workers in different branches, whose work is held up because the electrical work is not installed, preventing them from completing their own contracts. Those connected with the company have been engaged in following this special class of work for years and are thoroughly able to handle marine and fortification installations to the satisfaction of all concerned.

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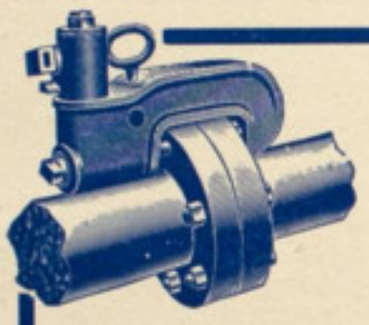

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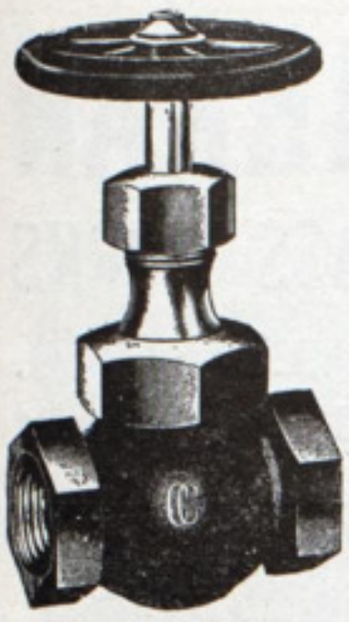

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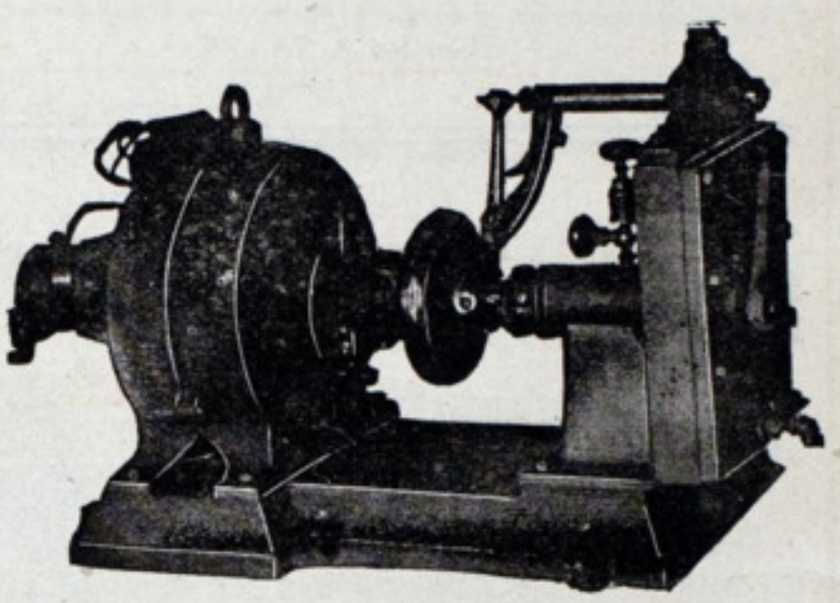

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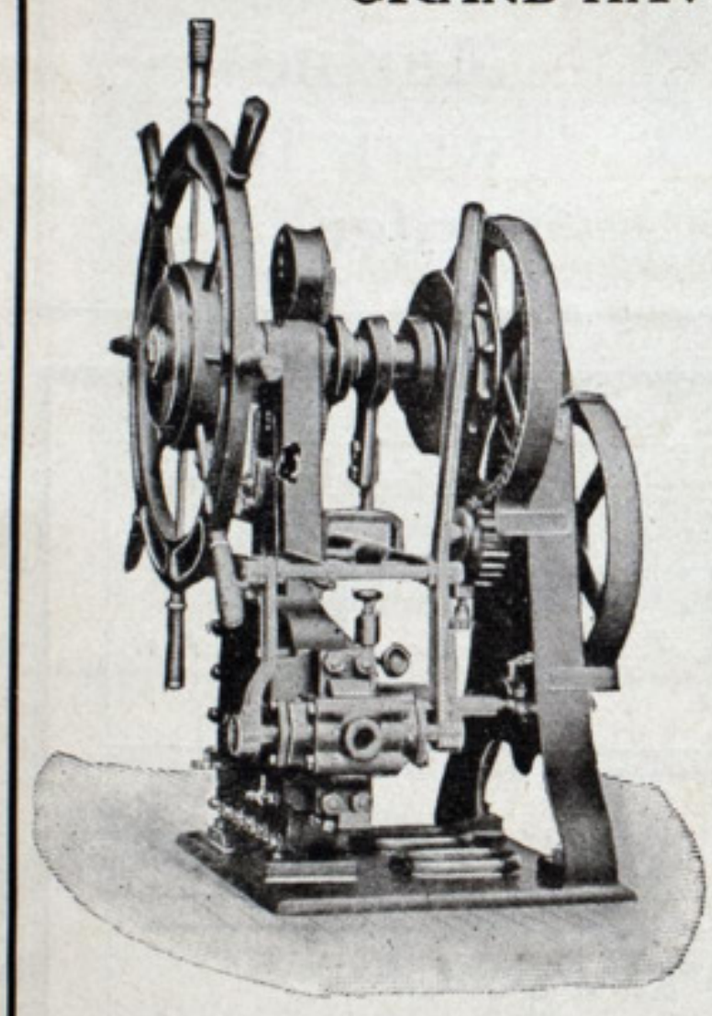

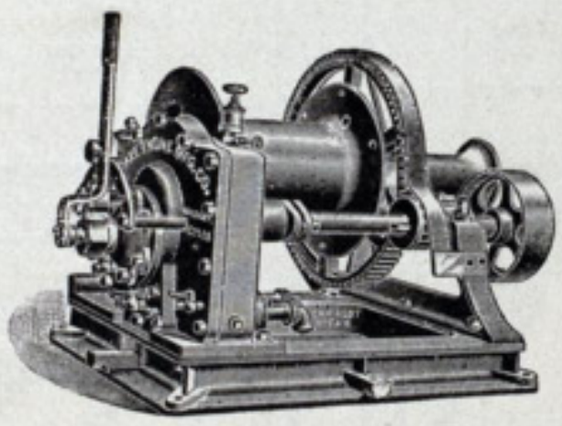

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Surplus over liabilities	1,672,952.40
Total Assets, January 1, 1902	10,079,478.50

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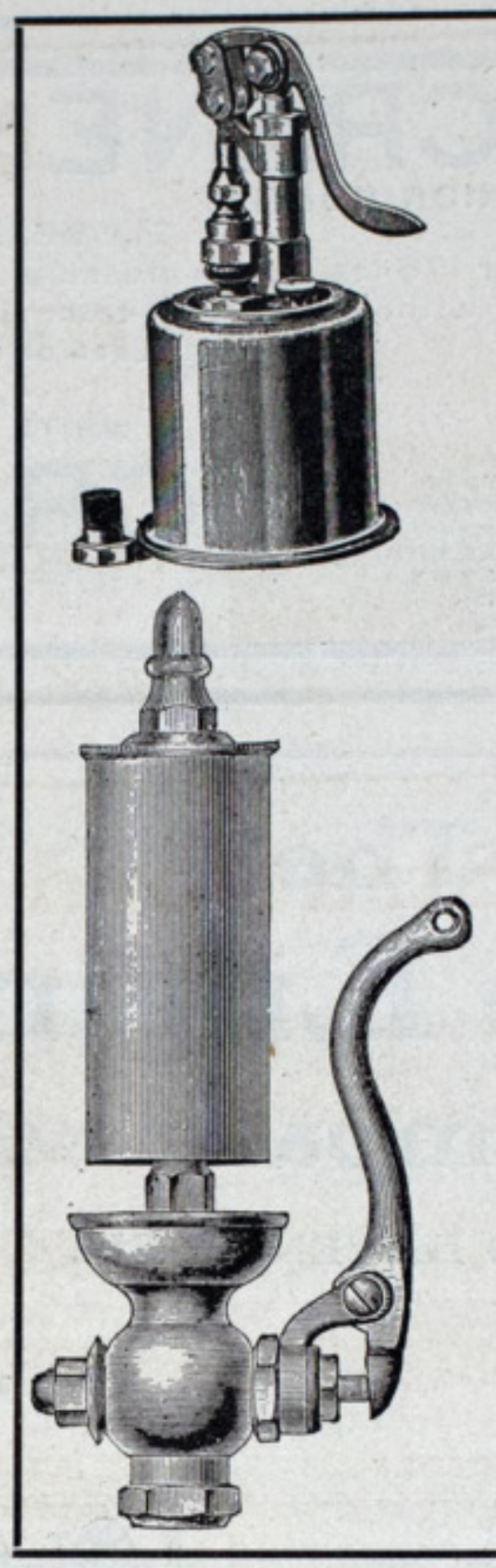

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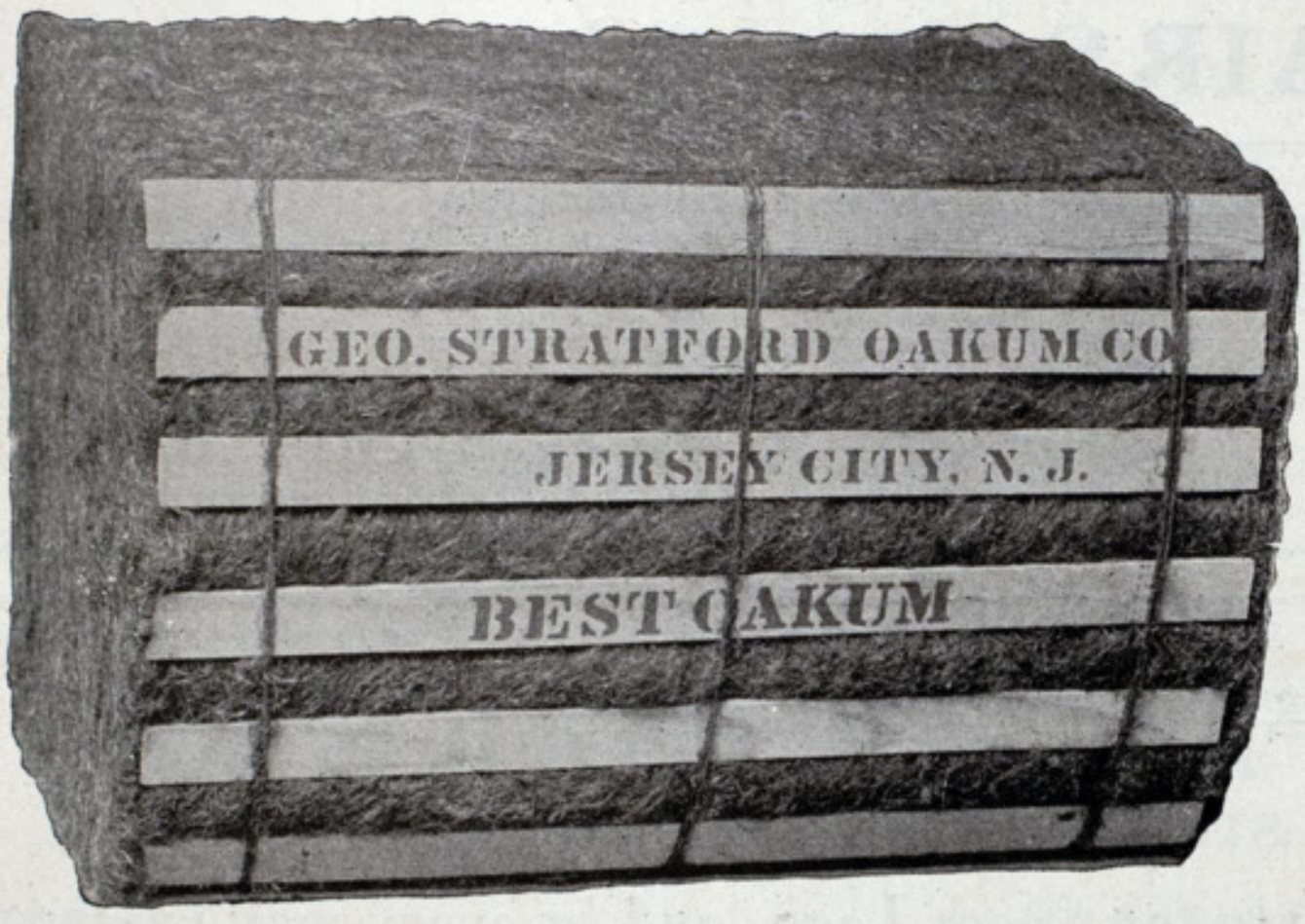

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Eastward.	Arrive from West	Depart East.
No. 18, Southwestern Lim	.....	1:50am
No. 22, Lake Shore Lim...	*2:15am	*2:20am
No. 20, Chi & Cleve Ex....	*7:20am	.....
No. 28, N Y & Bost Ex ...	*7:40am	*8:00am
No. 40, Toledo & Buff Ac.	†10:00am	†10:40am
No. 32, Fast Mail	*11:25am	*11:30am
No. 44, Ac via Sandusky..	†1:40pm	.....
No. 46, Southwestern Ex.	....	*3:00pm
No. 6, Lim Fast Mail....	*5:40pm	*5:45pm
No. 26, 20th Cent Lim....	*7:40pm	*7:43pm
No. 10, C., N Y & B Sp....	*7:30pm	*7:50pm
No. 16, New Eng Ex.....	*10:30pm	*10:35pm
No. 2, Day Express.	†9:10pm	†9 25pm
No. 126, Norwalk Accom.	†7:50am	.....
No. 106, Conneaut Accom	....	†4:30pm

Westward.	Arrive from East.	Depart West.
No. 25, 20th Cent Lim.....	*2:27am	*2:30am
No. 11, Southwestern Lim	*3:25am	....
No. 15, Bost & Chi Sp.....	*3:10am	*3:15am
No. 43, Fast Mail	*4:35pm	*4:40pm
No. 7, Day Express.	.....	†6:10am
No. 19, Lake Shore Lim..	*7:15am	*7:20am
No. 23, Western Express.	*10:30am	*10:35am
No. 33, Southern Express	*12:25pm	....
No. 133, Cleve & Det Ex..	....	*12:45pm
No. 47, Accomodation.....	†11.20am	†3:00pm
No. 141, Sandusky Accom.	.....	†3:10pm
No. 127, Norwalk Accom..	.....	†5:10pm
No. 37 Pacific Express...	*7:00pm	*7:20pm
No. 2, Fast Mail Lim.....	*10:50pm	*10:55pm
No. 115, Conneaut Accom.	*8:30am	.....

*Daily. †Except Sunday.

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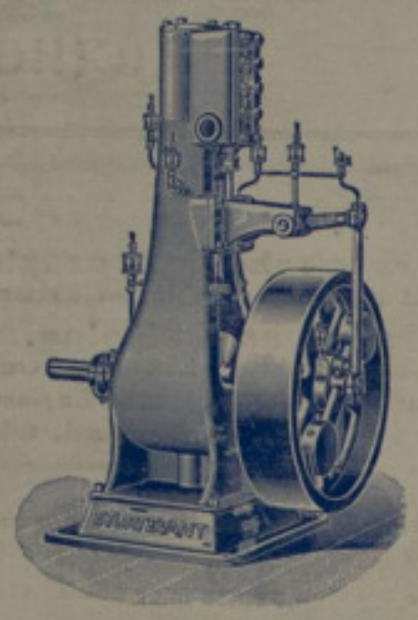

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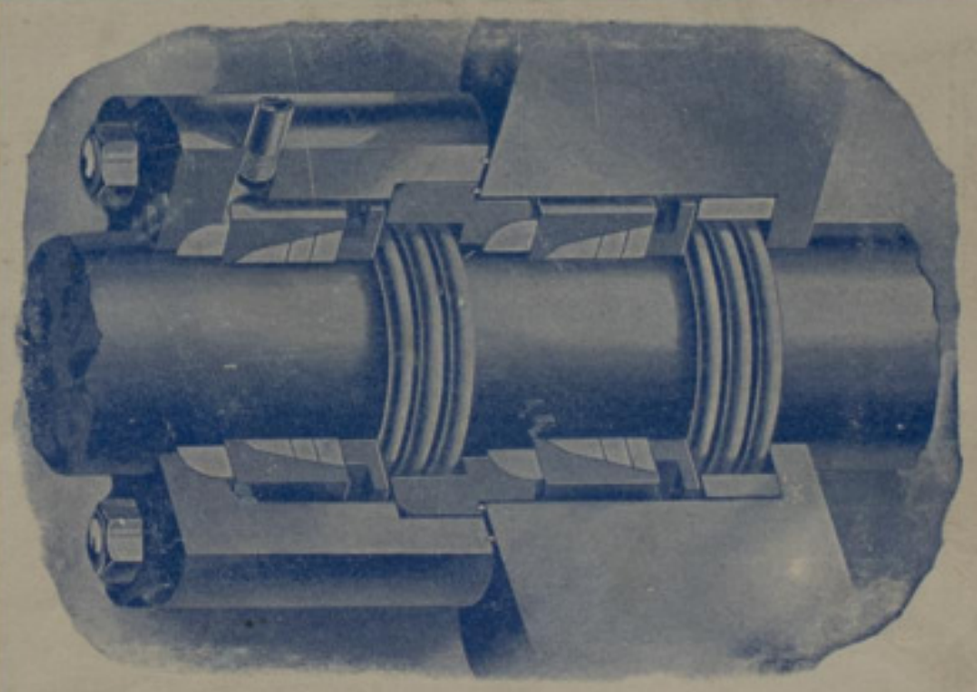

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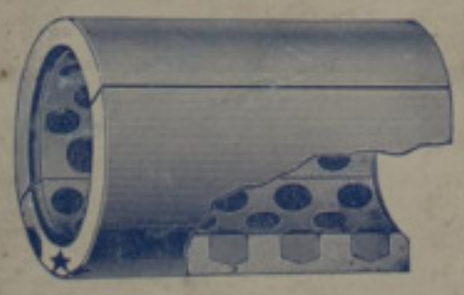

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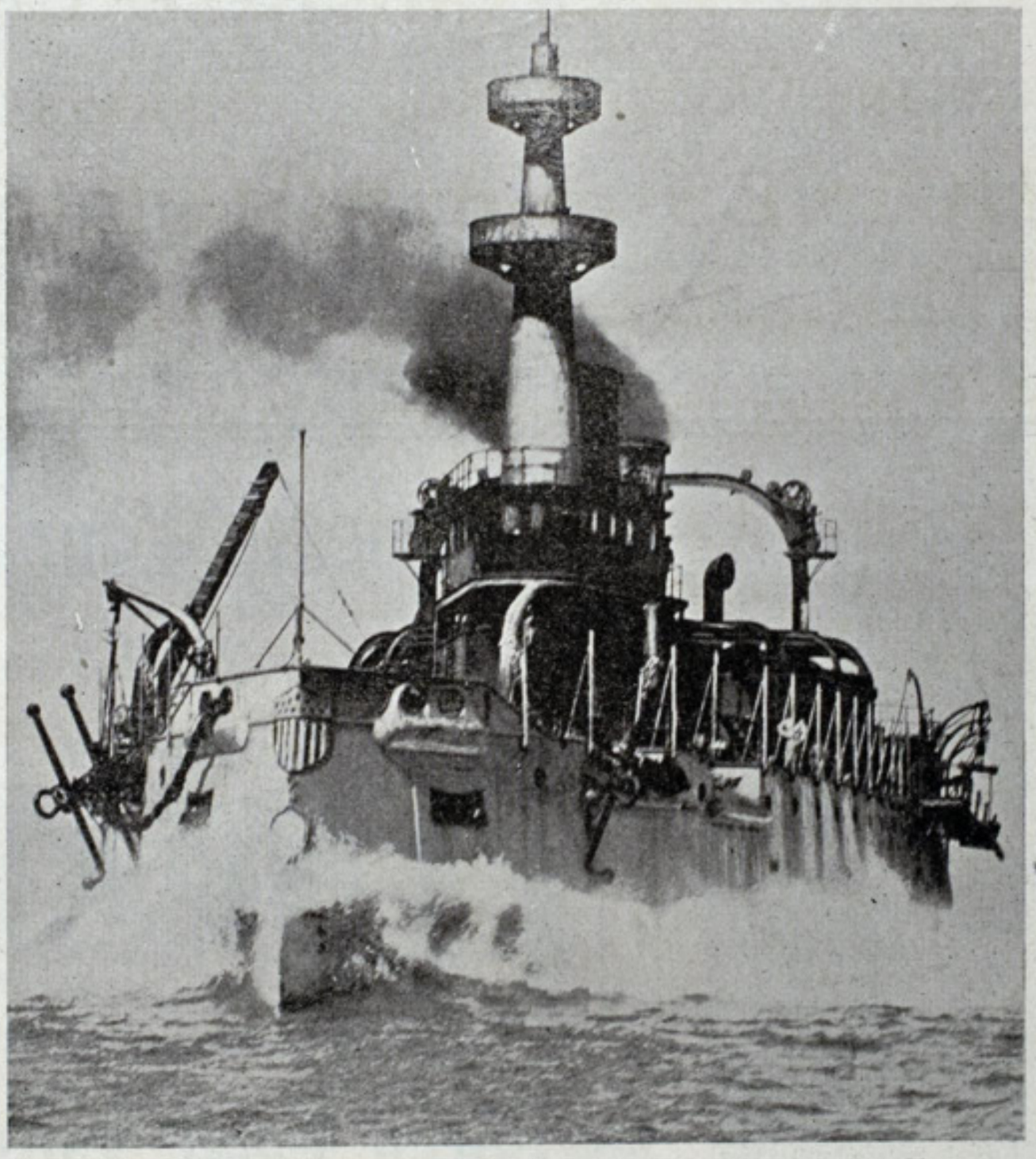

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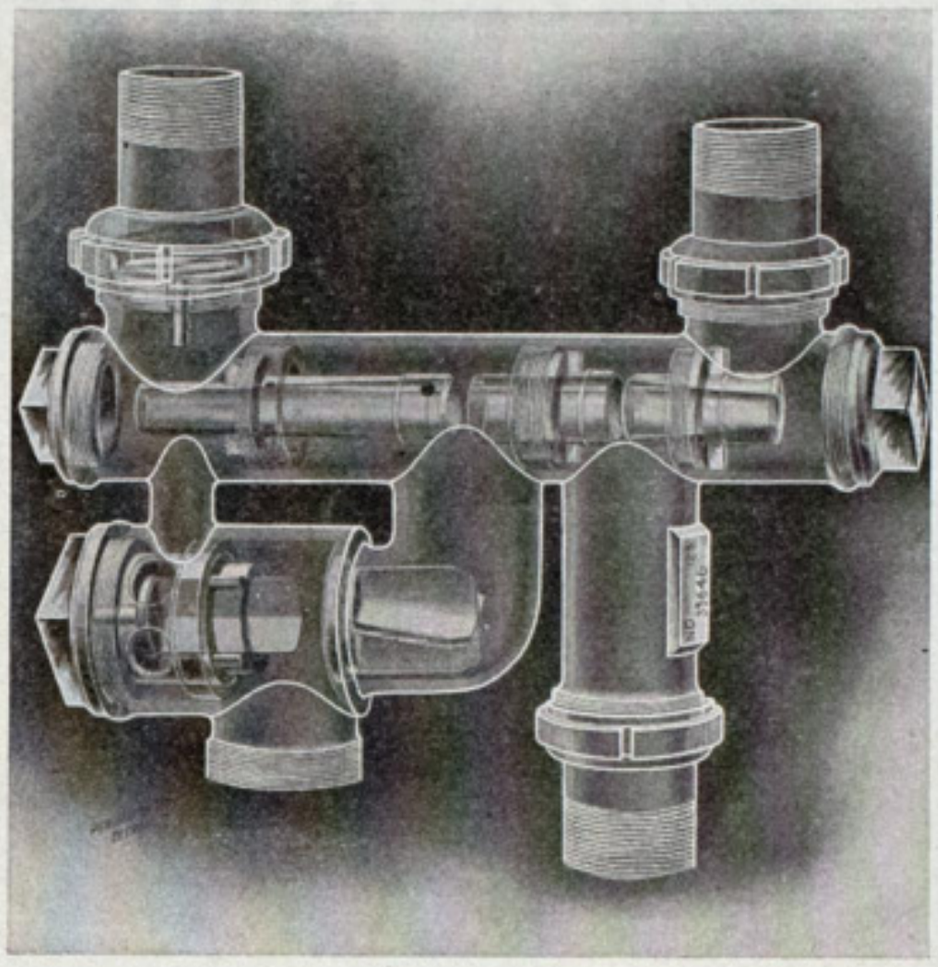

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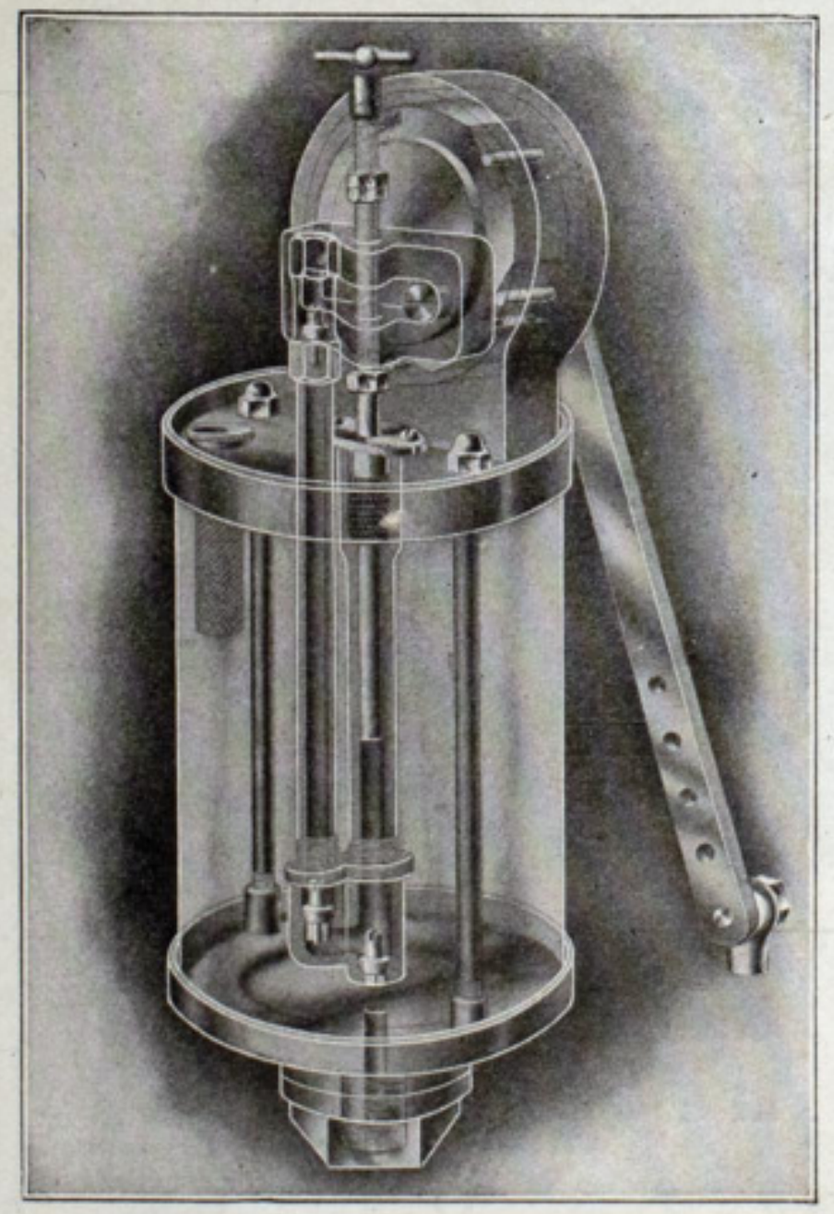

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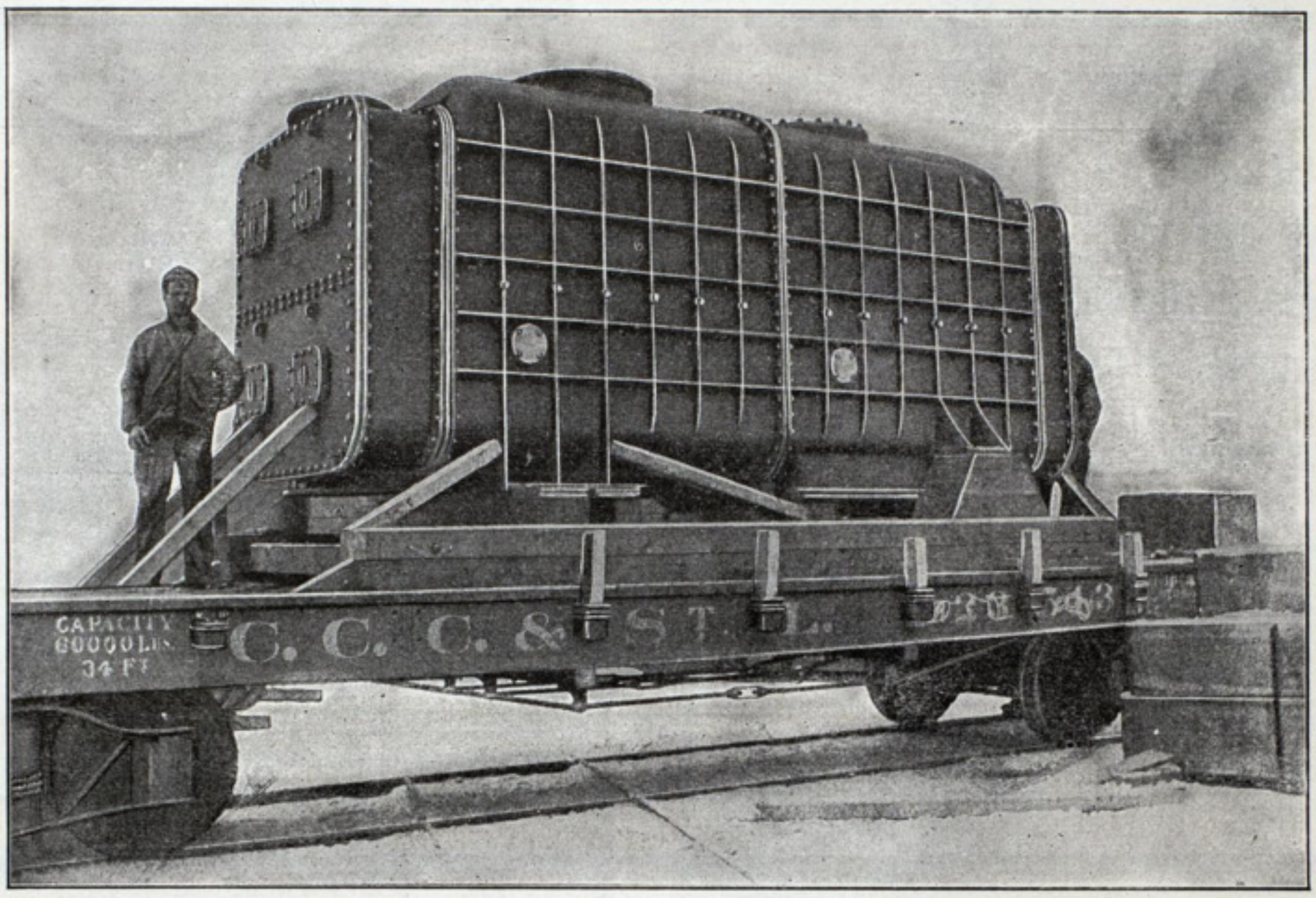

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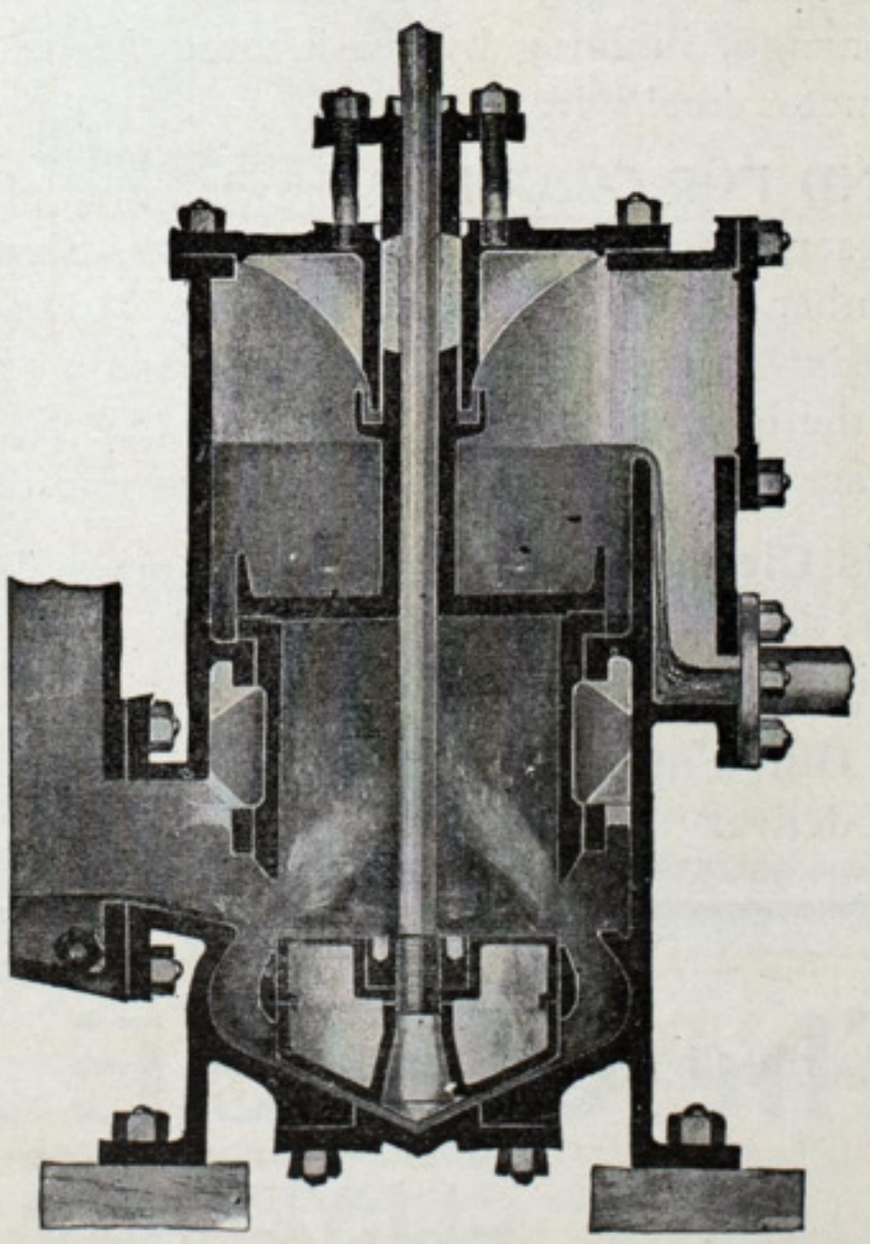

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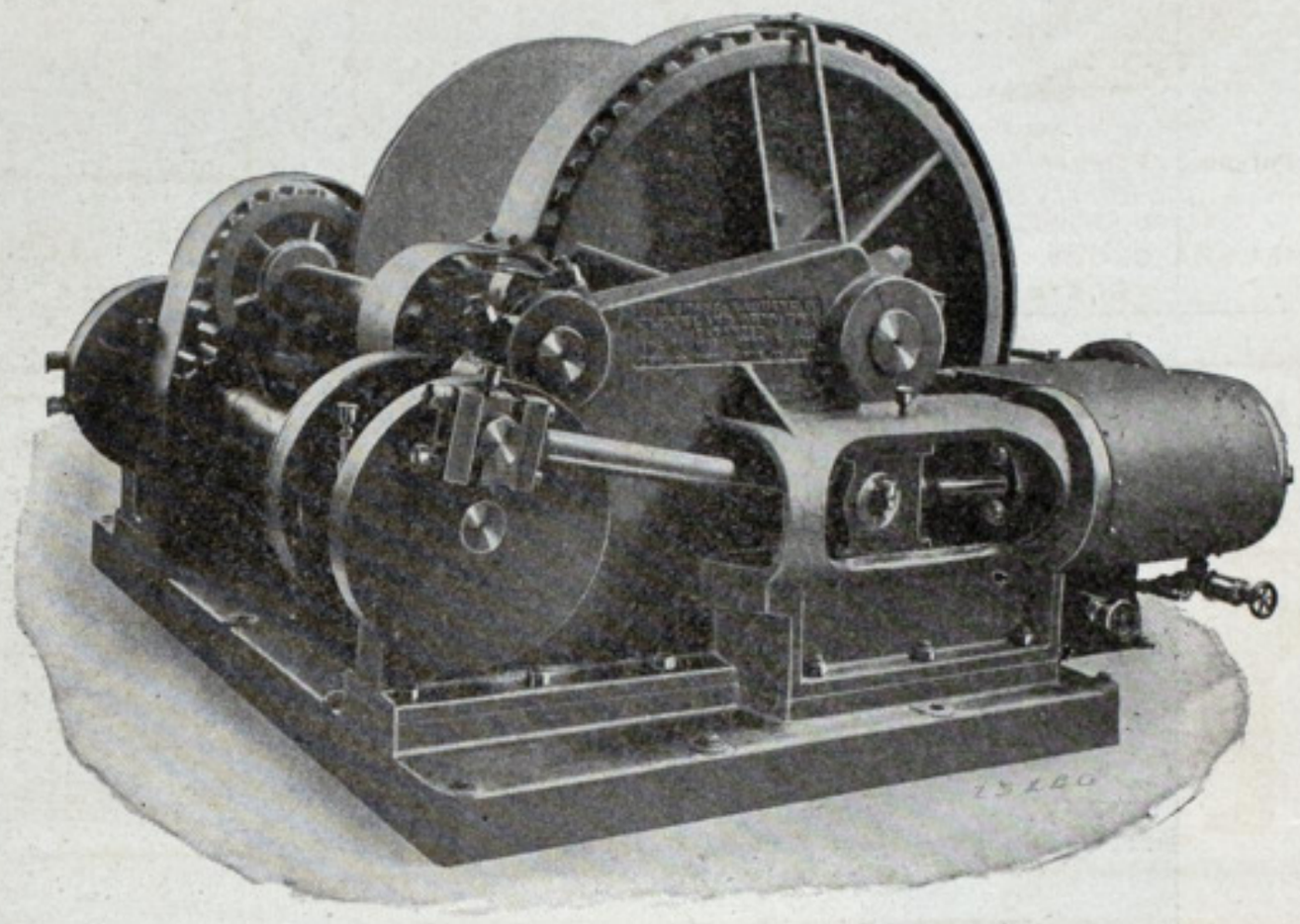

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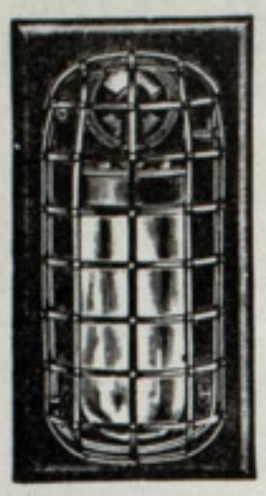

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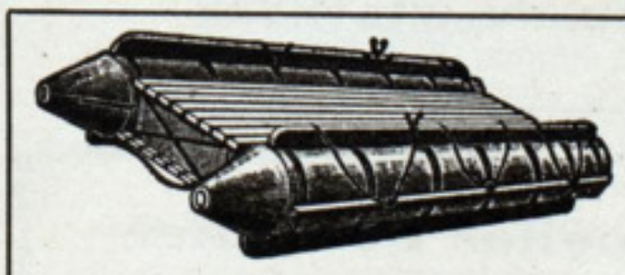

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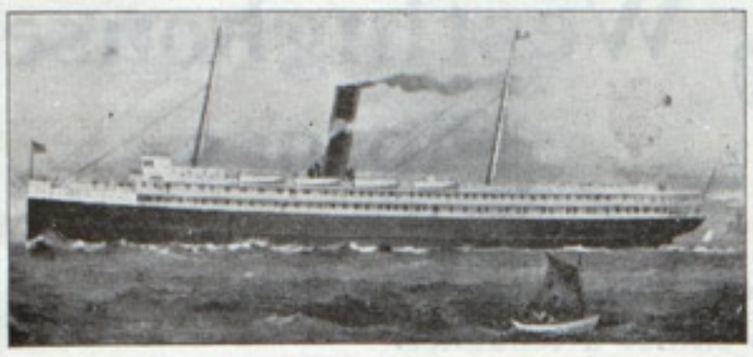

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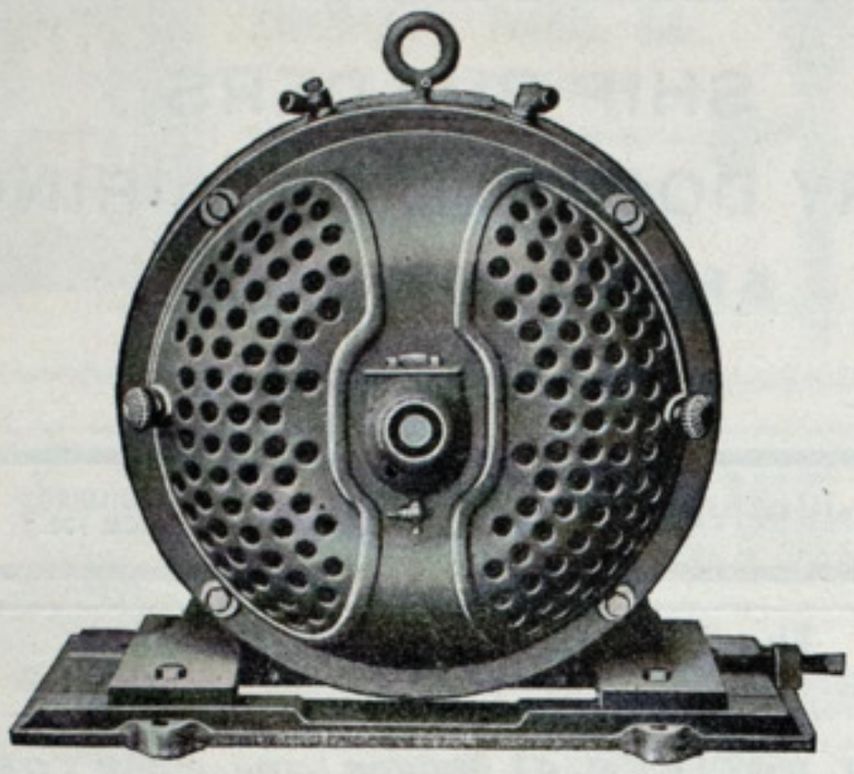

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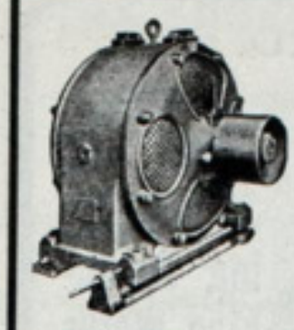

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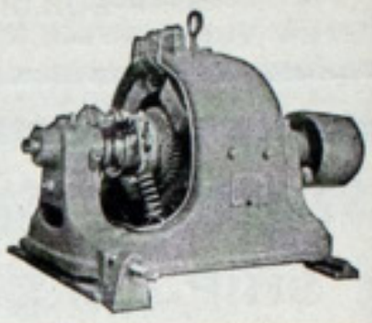

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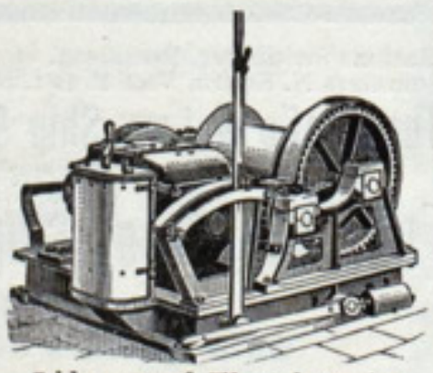

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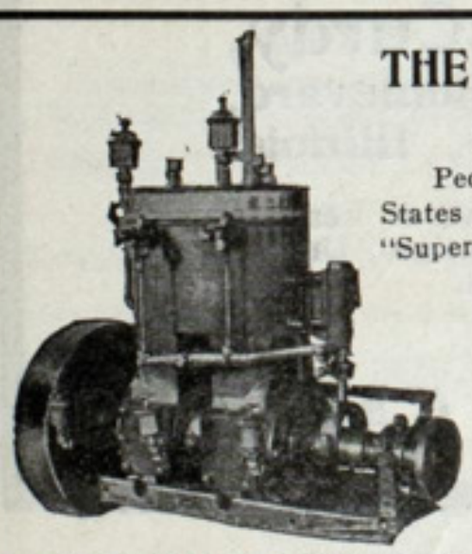

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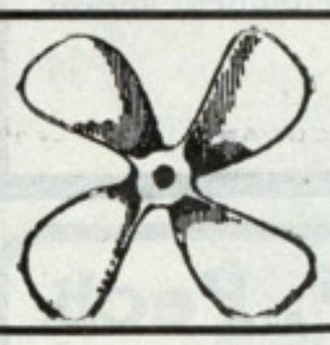

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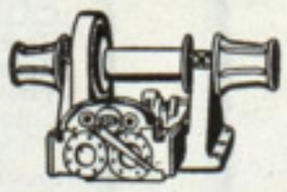

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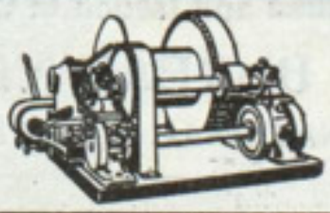

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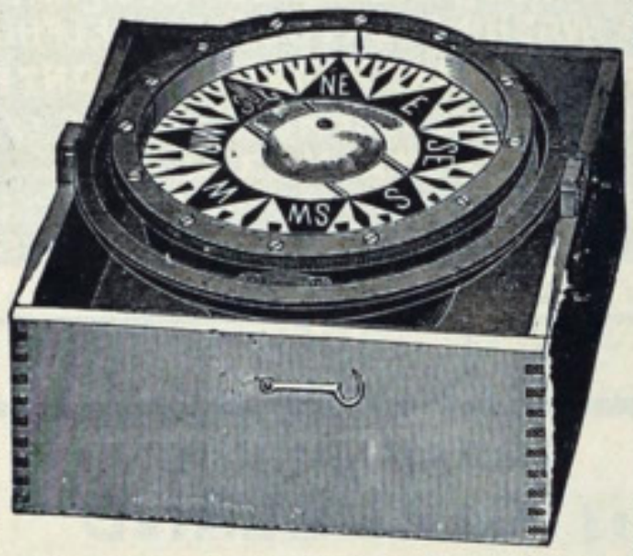

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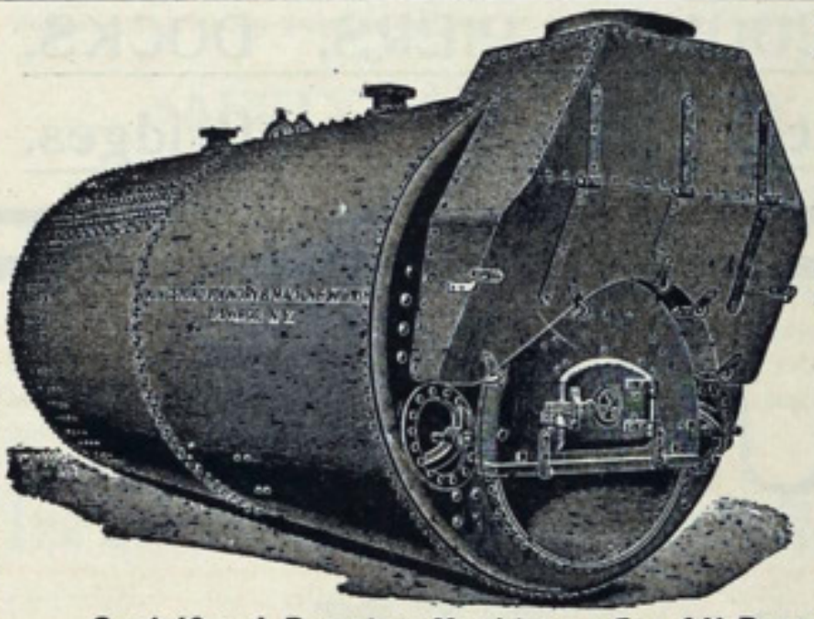

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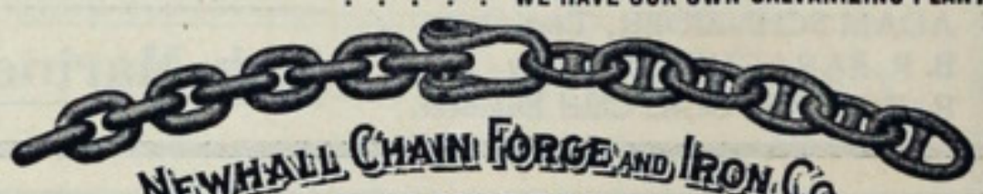

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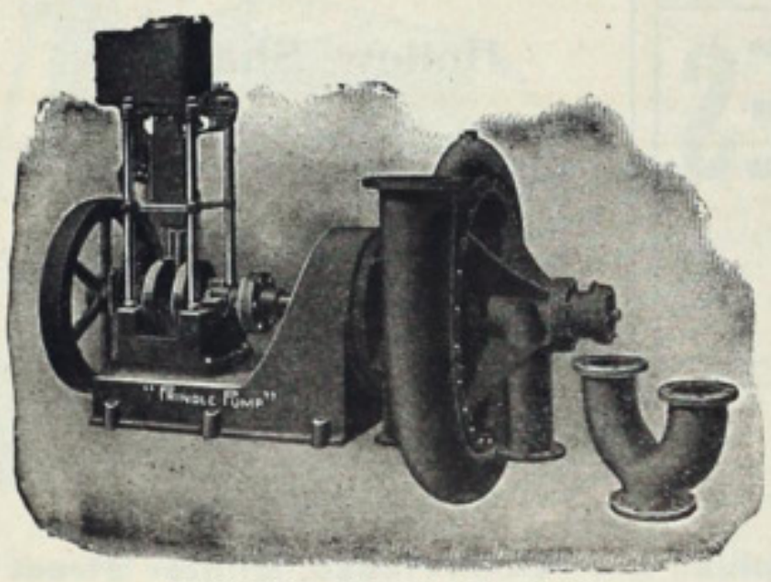

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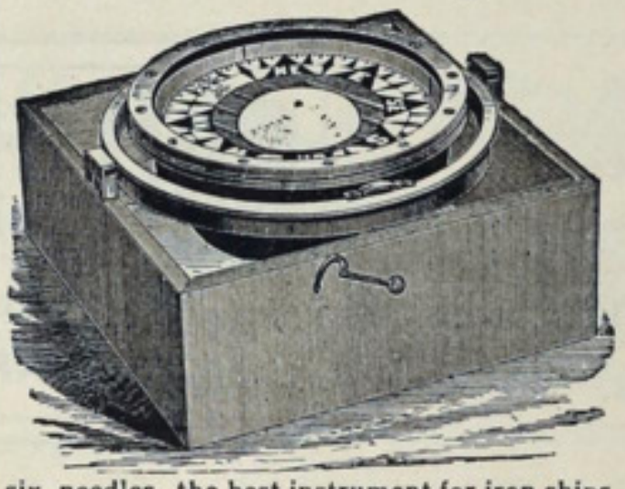

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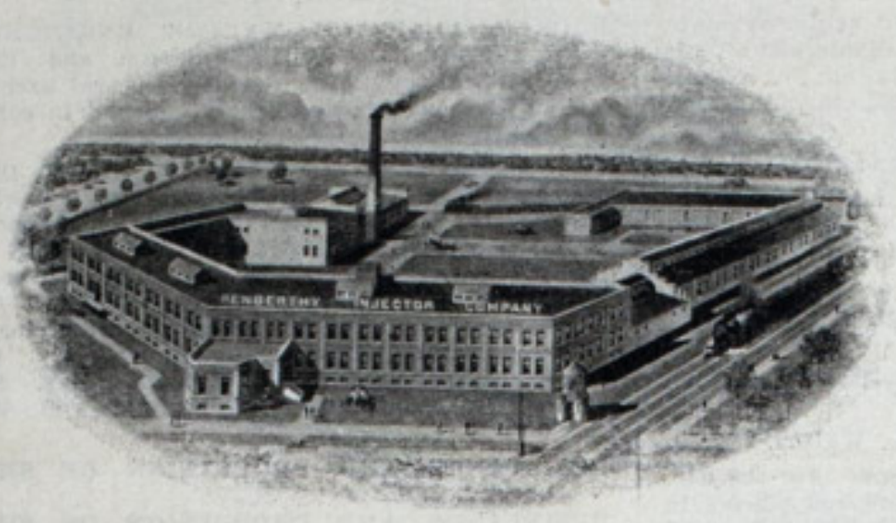

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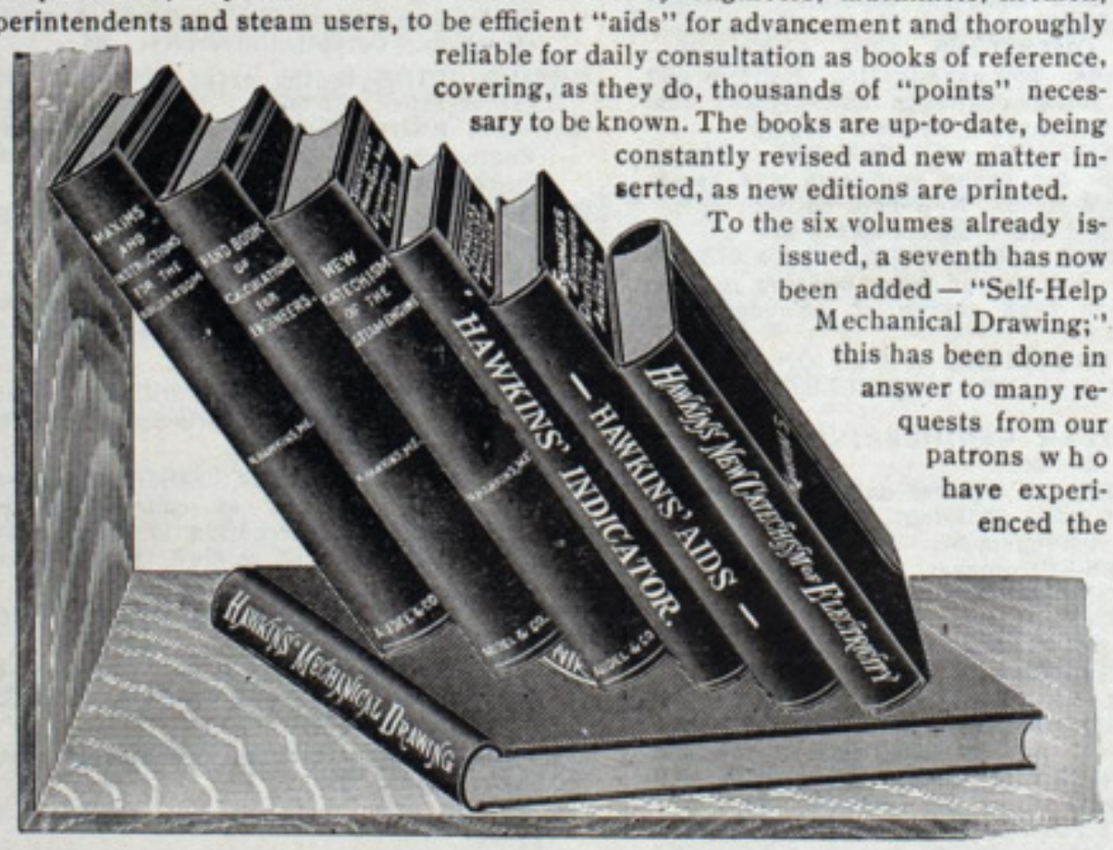

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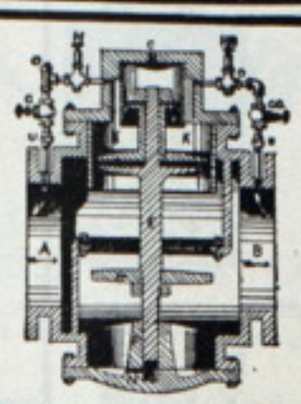

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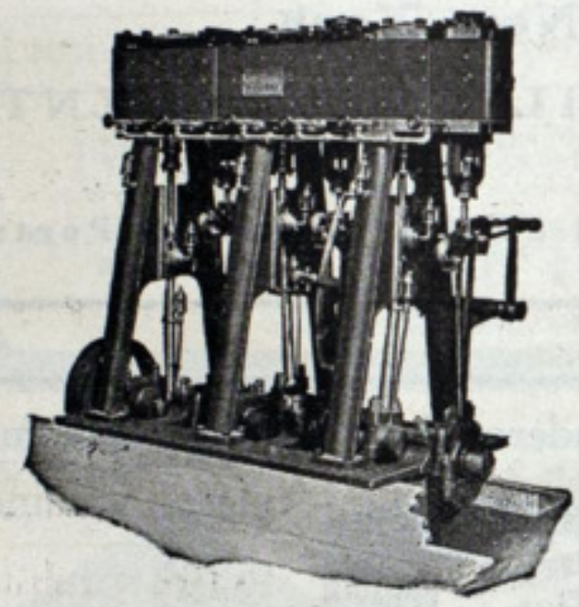

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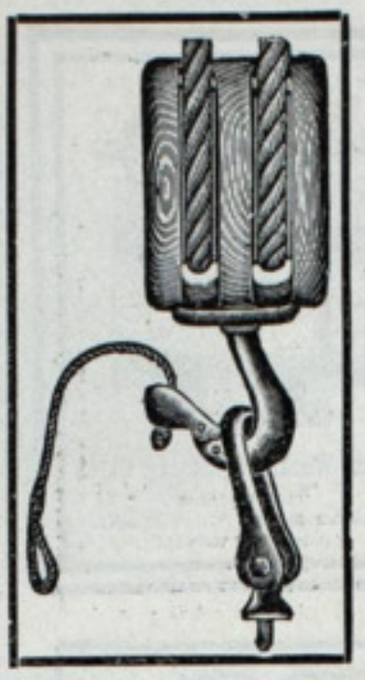

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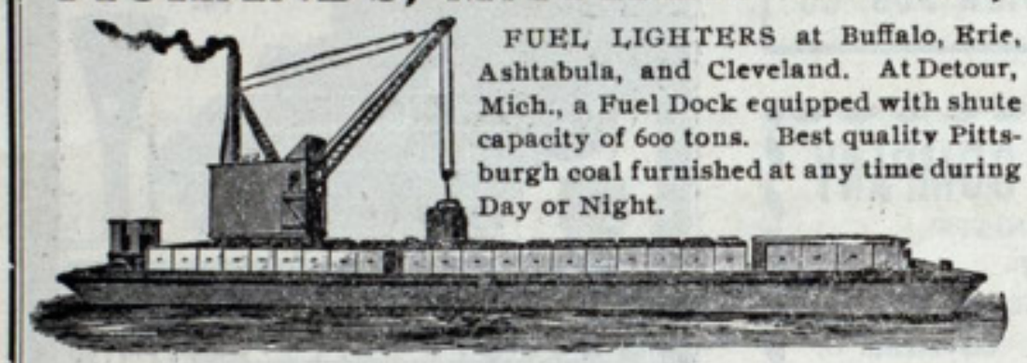

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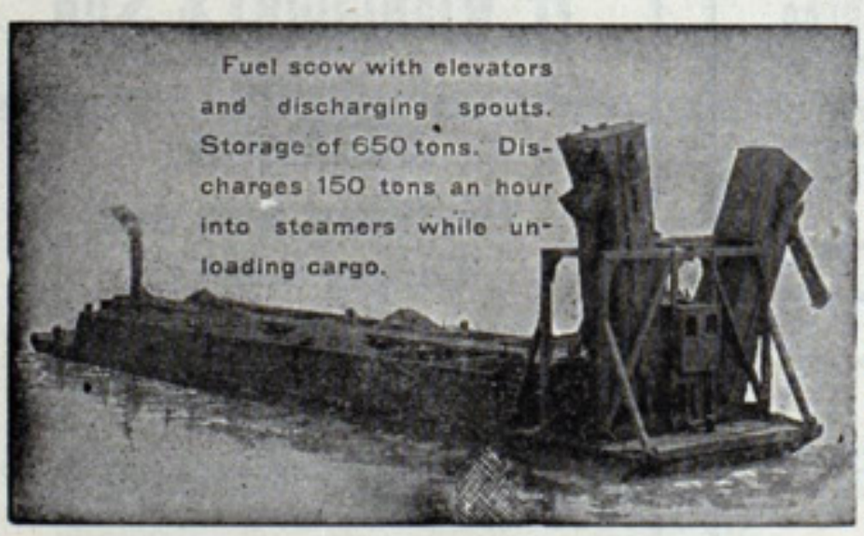

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OFFICE CHIEF OF ENGINEERS, U. S. Army, Washington, D. C., Nov. 26, 1902. Sealed proposals for building steel hull, furnishing and installing pumping and propelling machinery for suction dredge, and for ponton pipe line, will be received here until 2 p. m., Jan. 15, 1903, and then opened. Information furnished on application. MASON M. PATRICK, Capt., Engrs. Jan 8.

U. S. Engineer Office, Buffalo, N.Y., Dec. 22, 1902. Sealed proposals for channel and basin excavation in Lake Erie entrance to Black Rock Harbor and Erie Basin at Buffalo, N.Y., will be received here until 11 a. m. January 22, 1903, and then opened. Information furnished on application. T. W SYMONS, Major, Engrs. Jan. 15.

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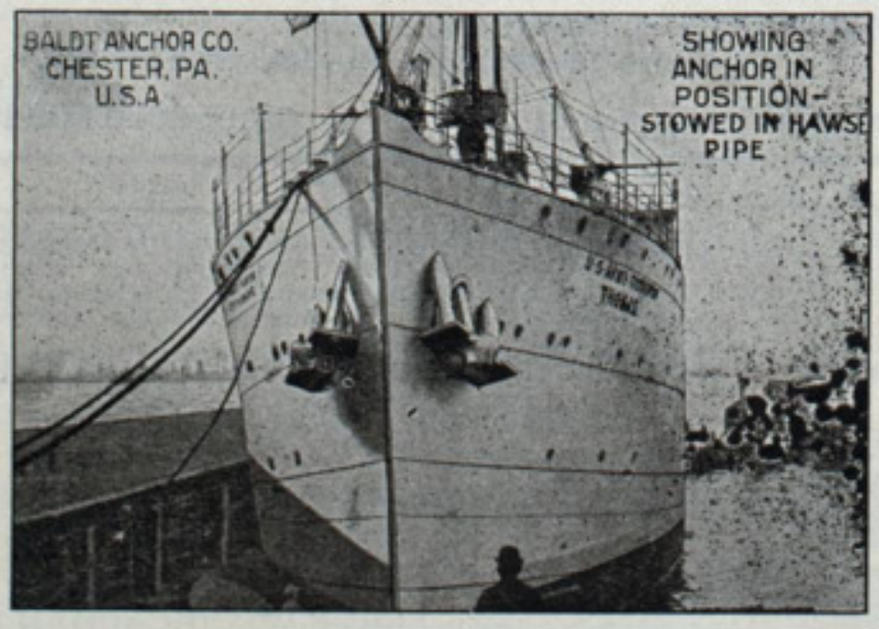

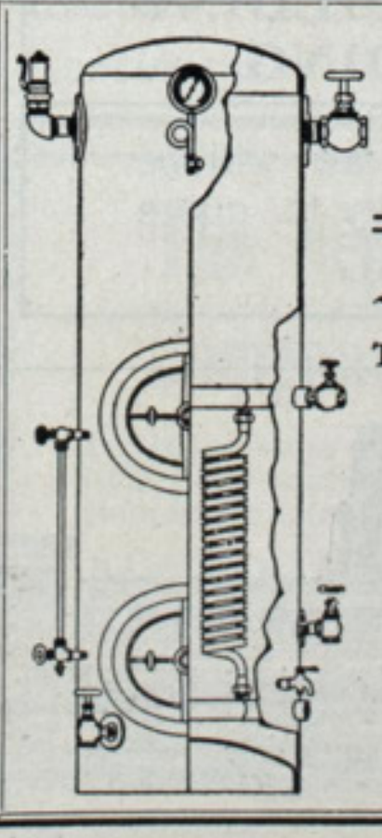

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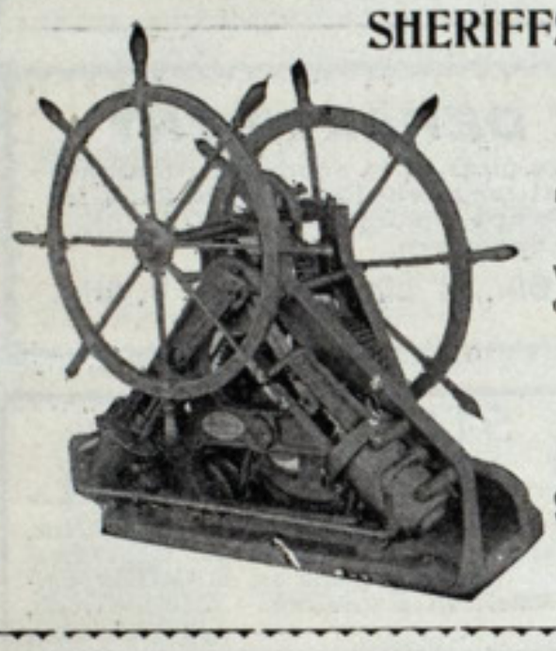

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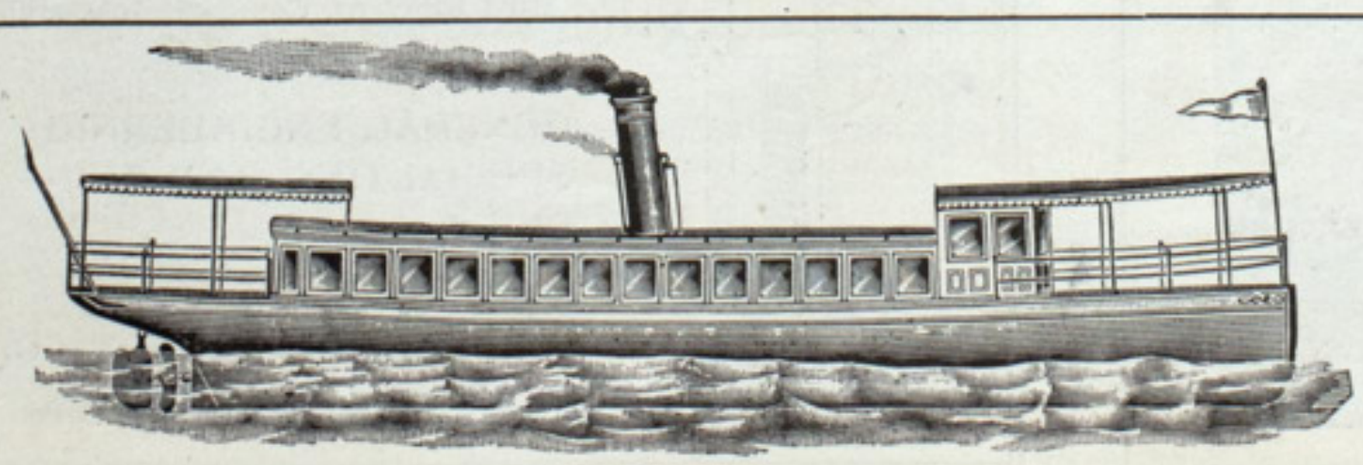

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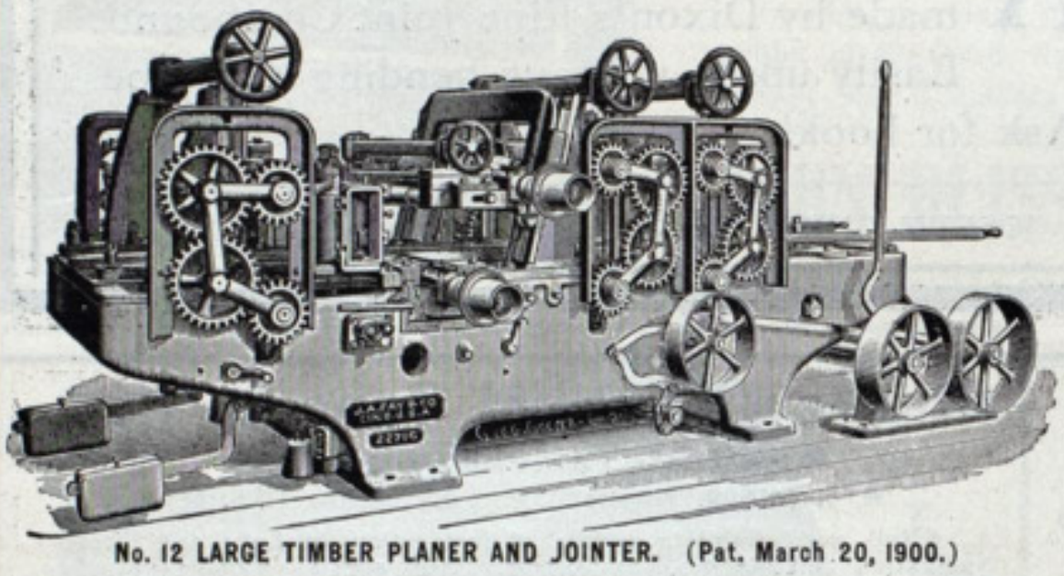

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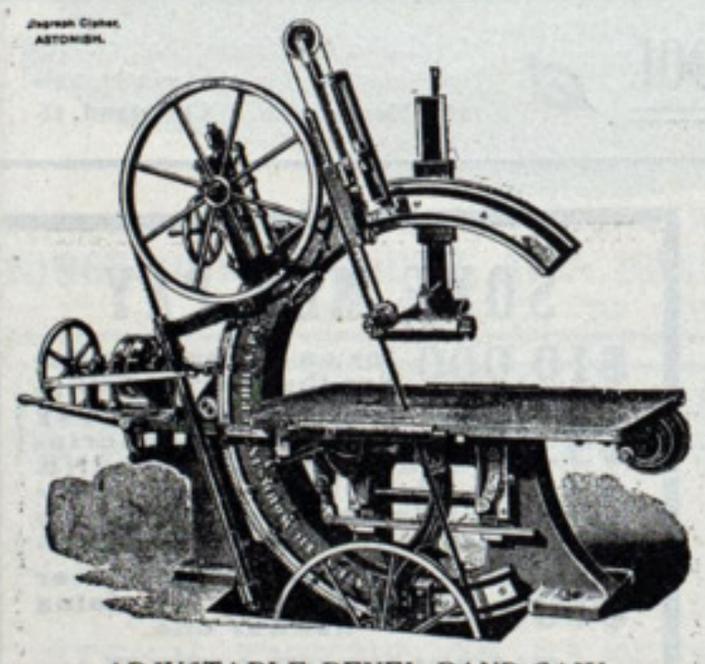

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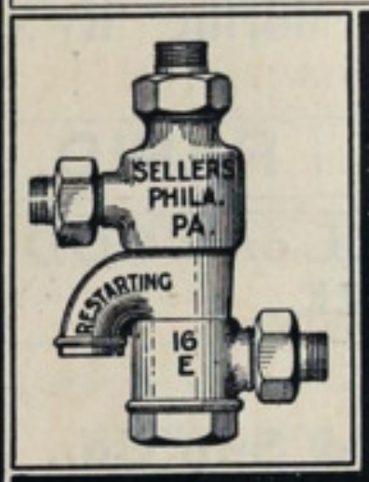

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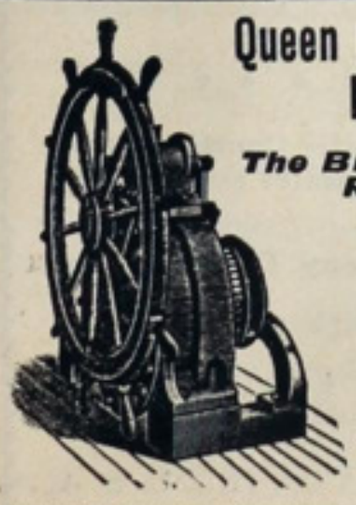

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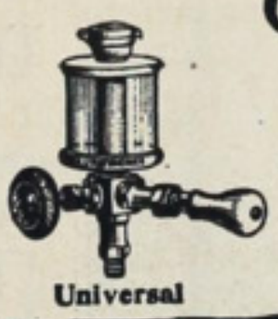
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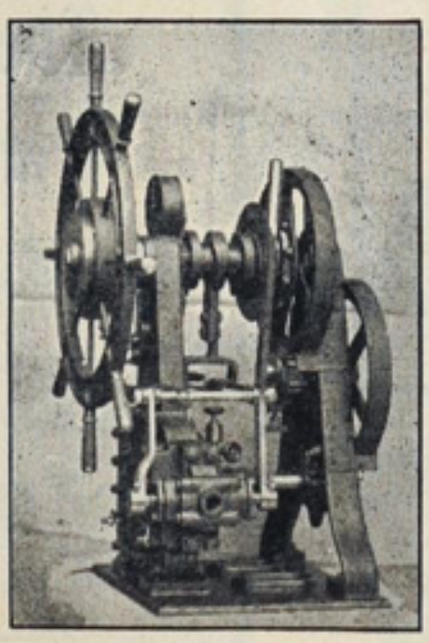

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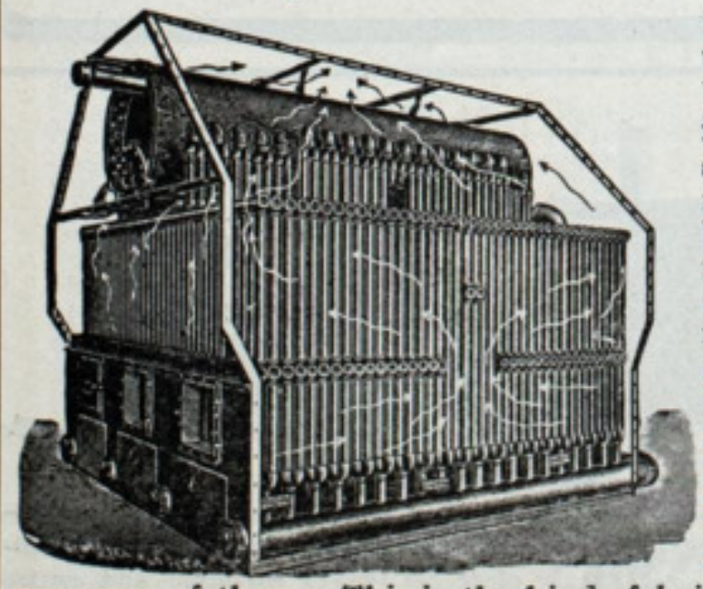

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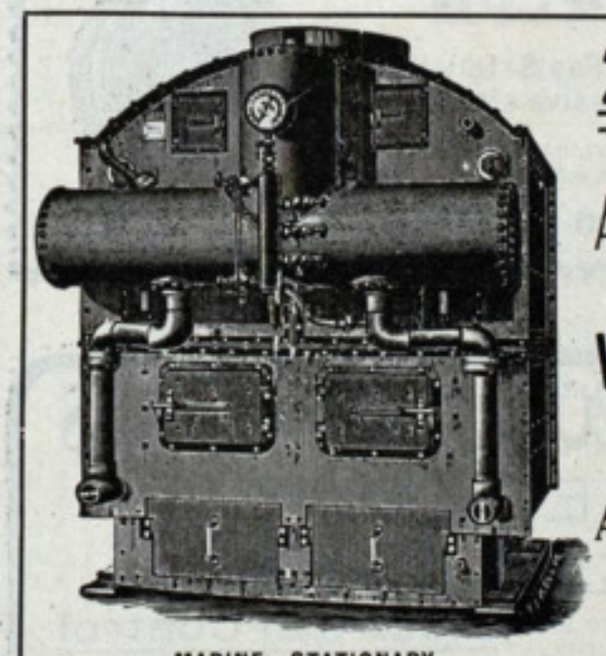

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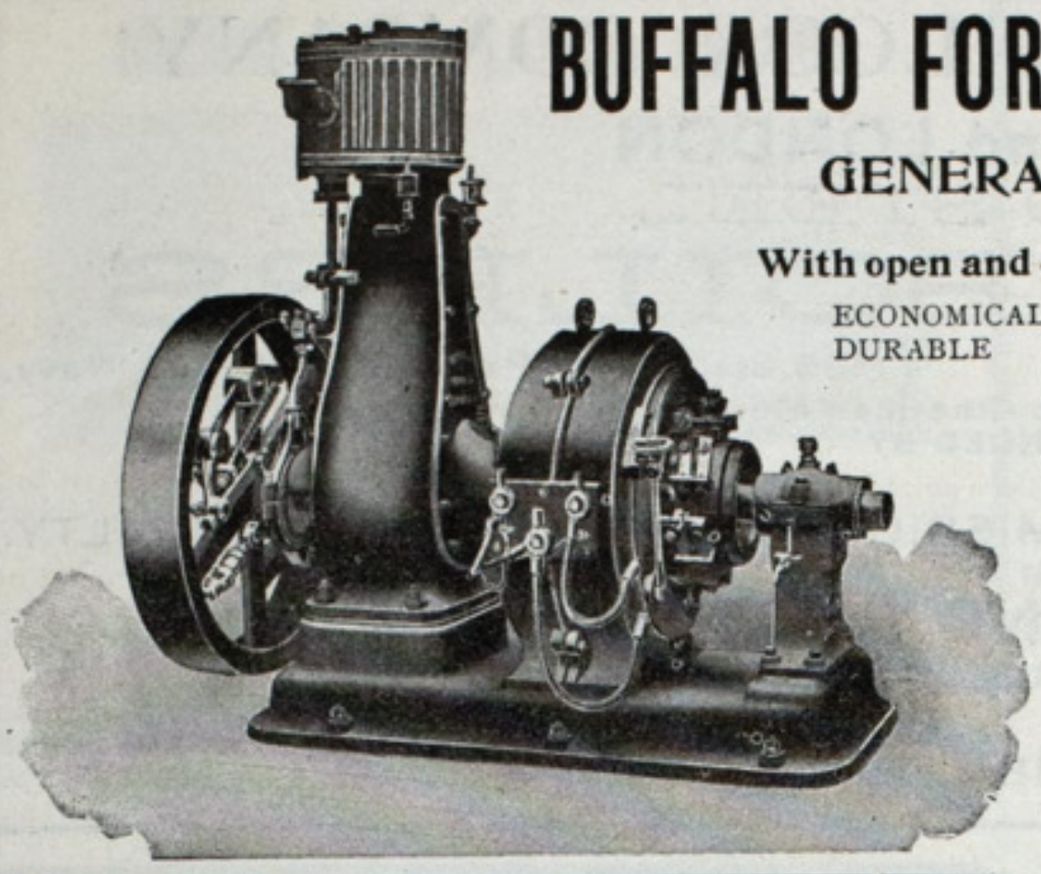

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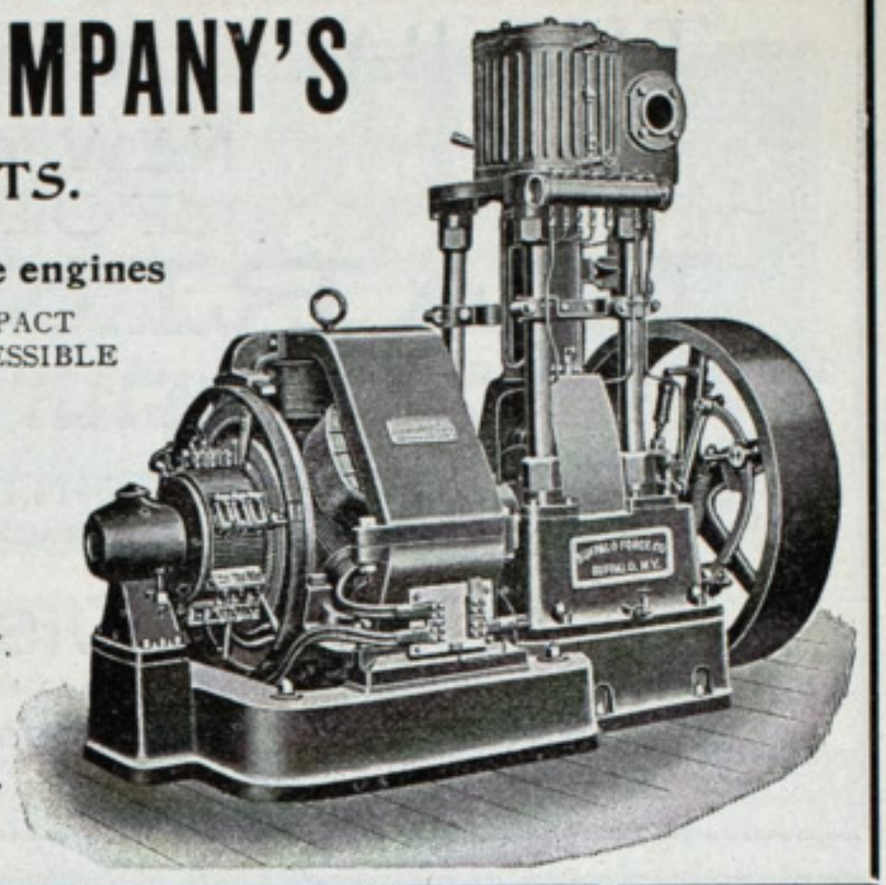

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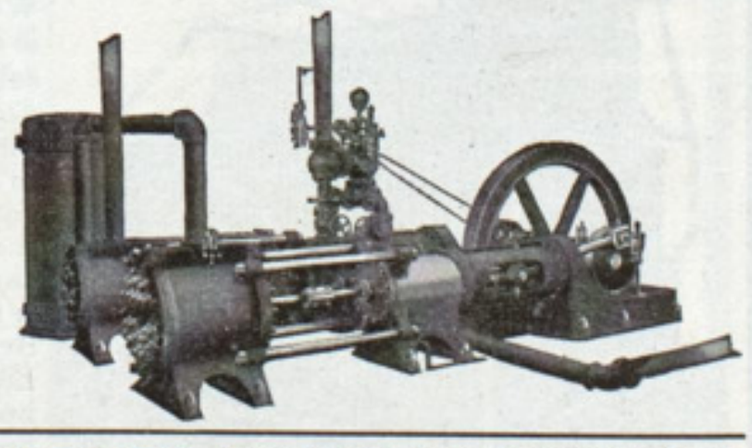

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MACLEAN HYDRAULIC SIGNAL.

The MacLean hydraulic signal, illustrated herewith, is an engine room telegraph which is named after Capt. Donald MacLean, a well known captain on the lakes of many years experience. It has been quietly worked out in practical use on the Puritan and other steamers during the last two years and is now in shape to stand the stresses of actual use and give perfect service in emergencies. The Erie & Western Transit Co.'s elegant passenger steamer, Tionesta, recently launched by the Detroit Ship Building Co., and which is to be one of the finest vessels of the lakes, has one of these machines and others have been ordered very freely, for a new invention.

The construction is strong and simple and the power (hydraulic) is immense. The balance is such that the machine works very easily over distances up to 500 ft. length and 40 ft. elevation, while the liquid will not freeze up or evaporate. A bell rings continuously in both the engine room and bridge ends of the signal until the signal has been obeyed, and the last signal given is shown by the position of the lever or needle on the instrument. The company is adapting the same apparatus to controlling the steam whistle and the wheelsmen, if desired. With the engine room, wheel house and whistle apparatus installed at each end of the vessel, the captain may go ahead or back down a river without the assistance of the mates and deck hands. He can control all three from a single position at either end of the boat, whereas in backing down at present he generally remains on the bridge to operate the whistle and direct the wheelsman, using the mate and a megaphone at the rear.

The apparatus will soon be exhibited for a short time in operation in the Perry-Payne building at Cleveland and other means will also be taken to bring it to the attention of vessel owners, captains and engineers. A stock company has recently been organized to market the invention under the name of the MacLean Hydraulic Signal Co., with offices at 317 and 319 Manhattan building, 315 Dearborn street, Chicago, which is on the floor below the custom house in Chicago and is therefore convenient of access to captains and owners.

The Chicago Pneumatic Tool Co. has issued invitations to all of its representatives, both of this country and in Europe, to attend a general meeting, which will be held at the general offices of the company, 1010 Fisher building, Chicago, on Jan. 5. It is proposed at this meeting to have the reports of representatives dealing with the trade conditions in the various parts of the civilized world gone over very carefully and a more thorough understanding secured of the requirements of both foreign and domestic customers. It is proposed to transact foreign business by American methods and it is therefore necessary to have all the representatives of the company keep in close touch with each other. It is expected that this general meeting will be repeated each year as it will enable the company to fulfill customers requirements more satisfactorily.

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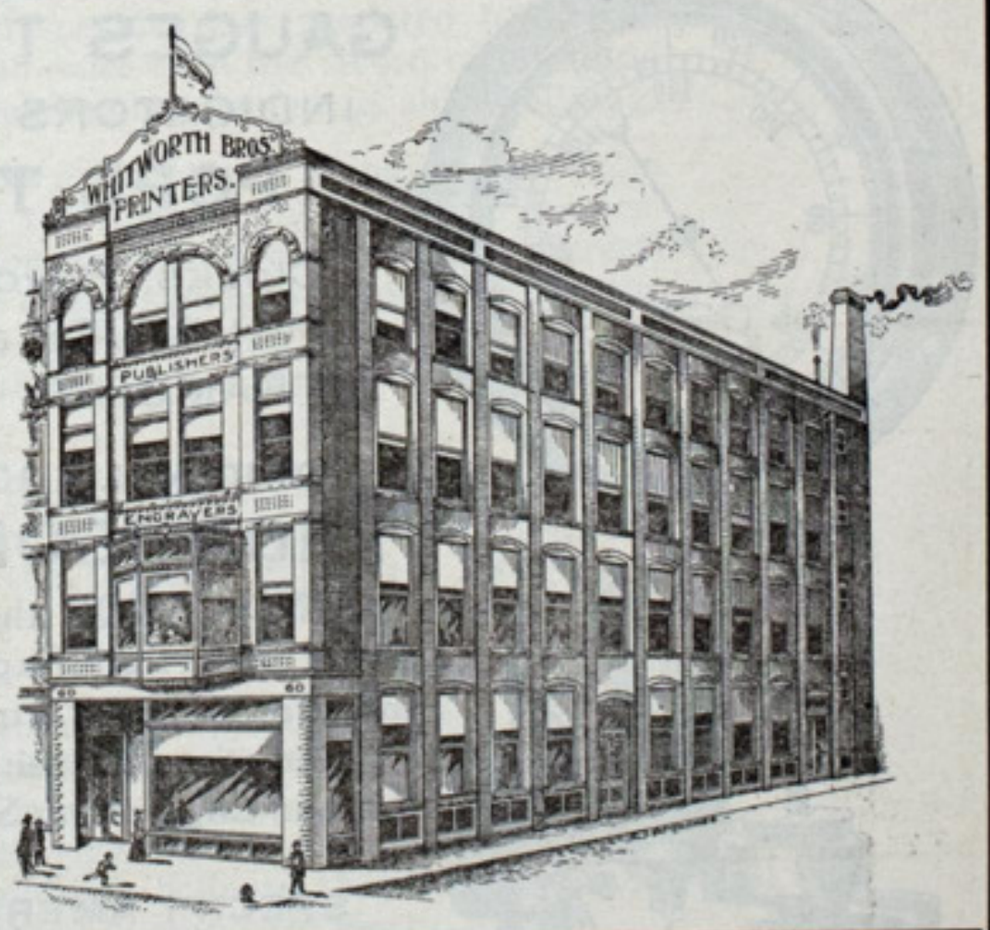

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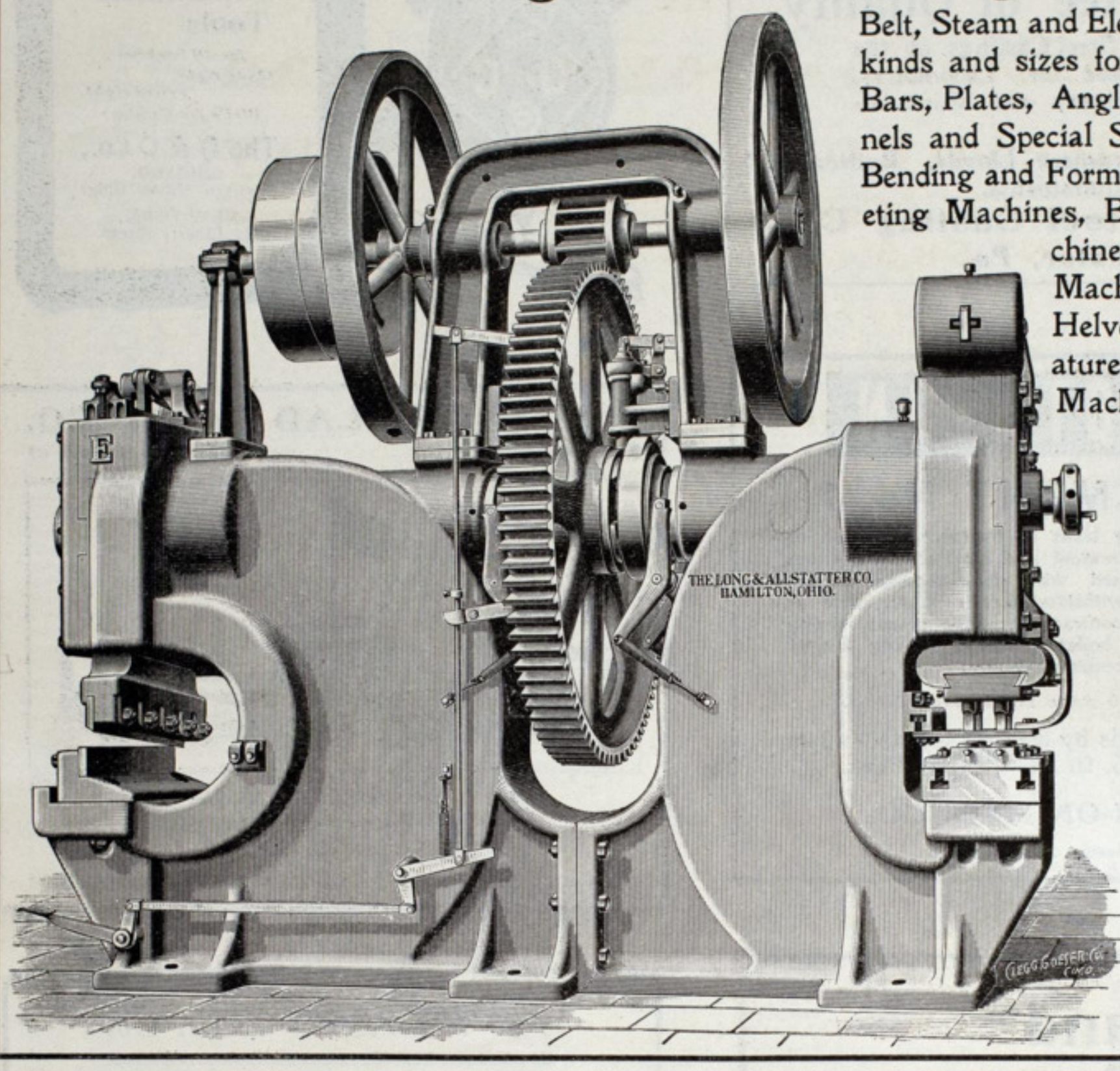

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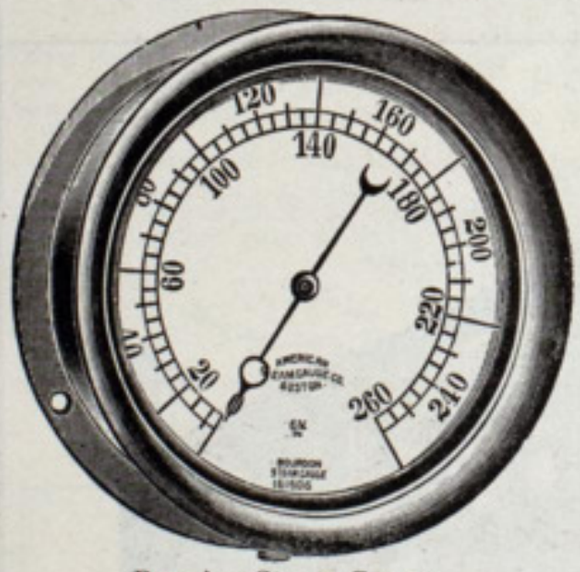

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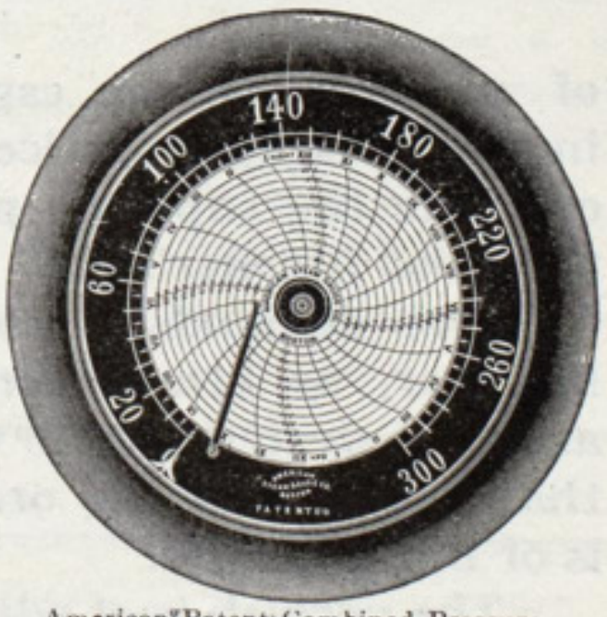

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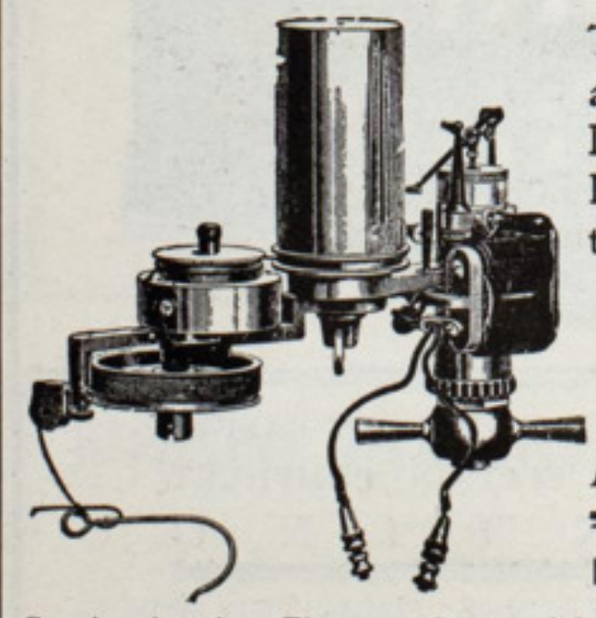

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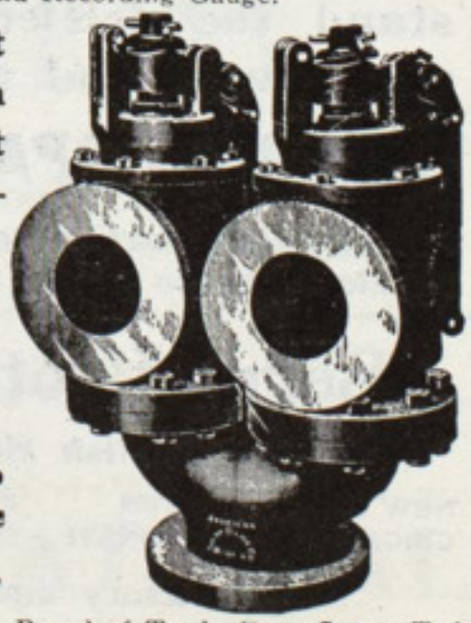

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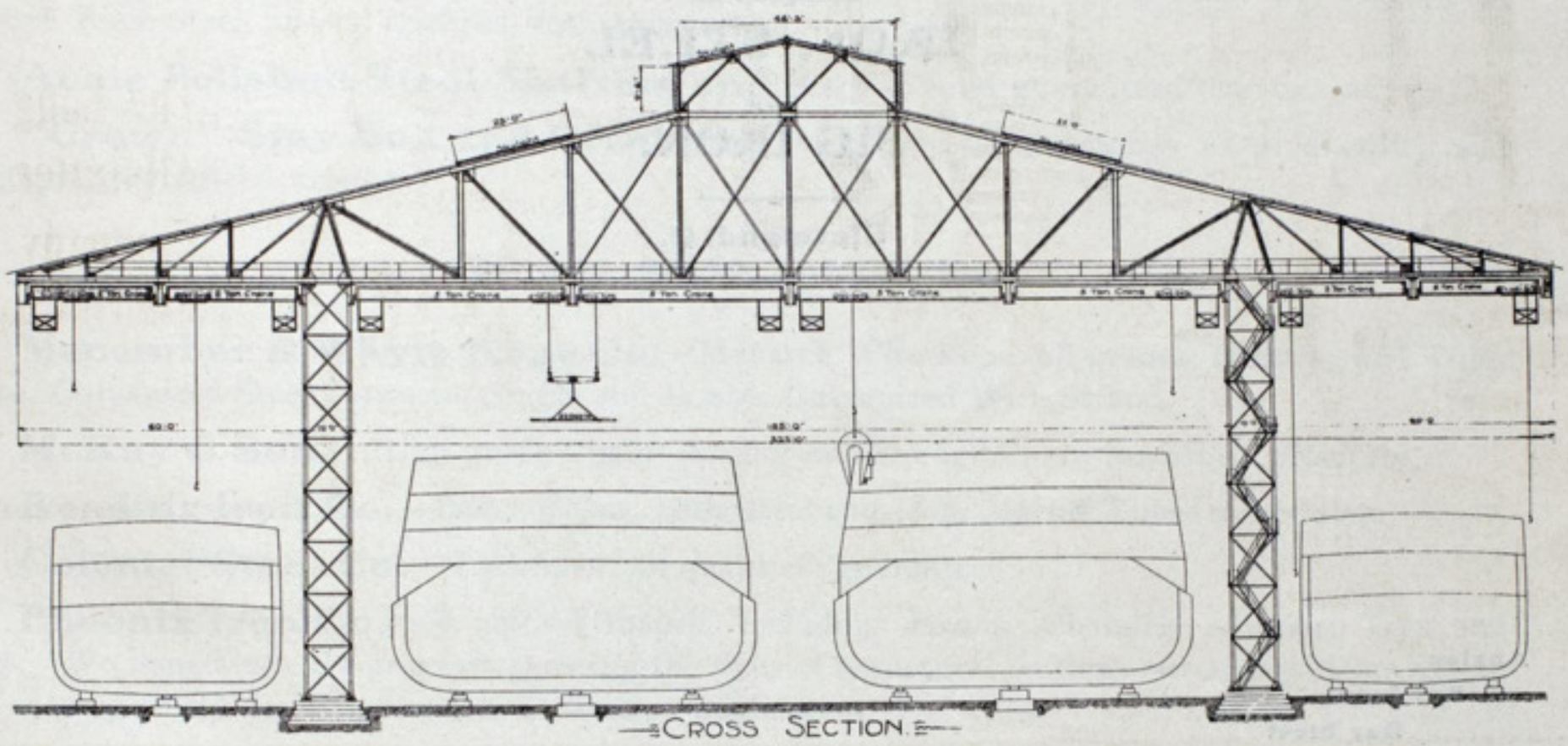

In the illustration above is shown the crane service over the building berths of the Fore River Ship & Engine Co.'s ship yard at Quincy, Mass. This service was constructed entirely from designs and specifications prepared by us and was put in operation in June of last year, and since then the record of handling of material by this service has been something unprecedented in ship building.

One of the first day's work of this service was as follows: Bringing out from the end of the yard and putting in place on the keel of the ship, 74 frames. This work was done with 16 men in eight hours working time. An interesting comparison of this work is the record of the average output in one of the largest ship yards on the Atlantic Coast, i. e. working with the ordinary type of double cantilever cranes, 116 men working 10 hours put in place 25 ship frames of a similar construction.

The framework of the Fore River Ship & Engine Co.'s yard is designed not only to support the traveling cranes which perform this remarkable duty, but also a roof covering which is to be added in the future. This will form a protection for the yard in inclement weather, and add greatly to the comfort of the workmen and the output of the yard.

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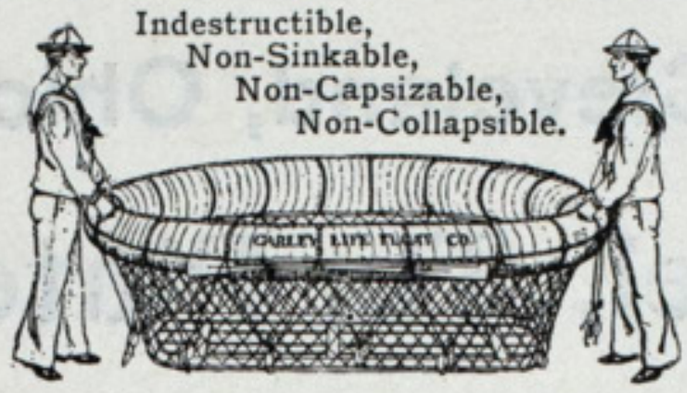

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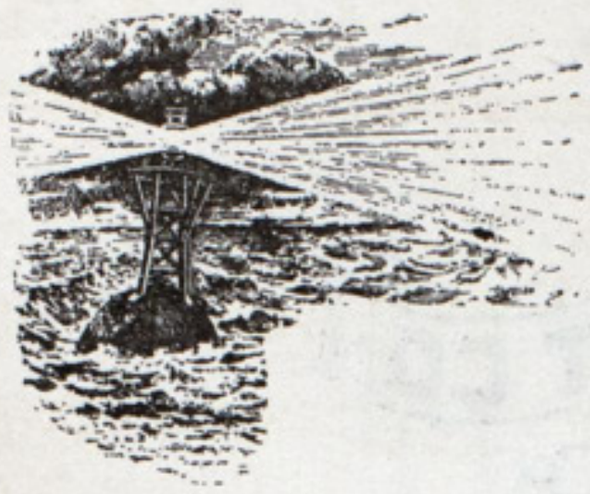

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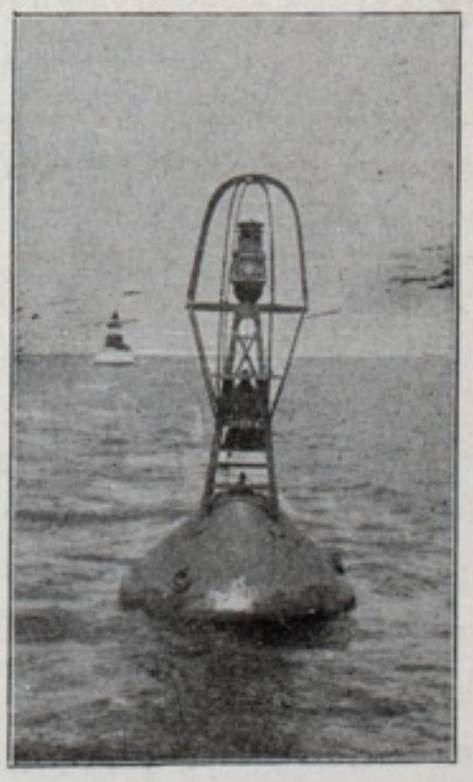

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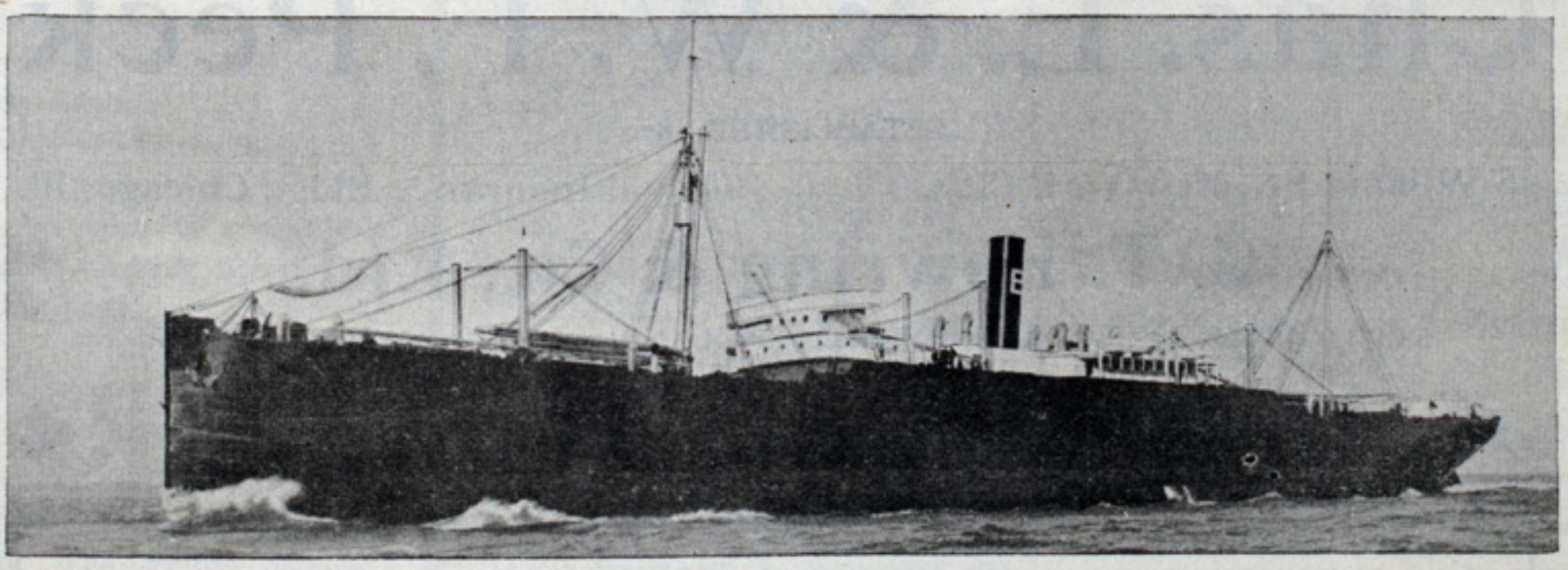

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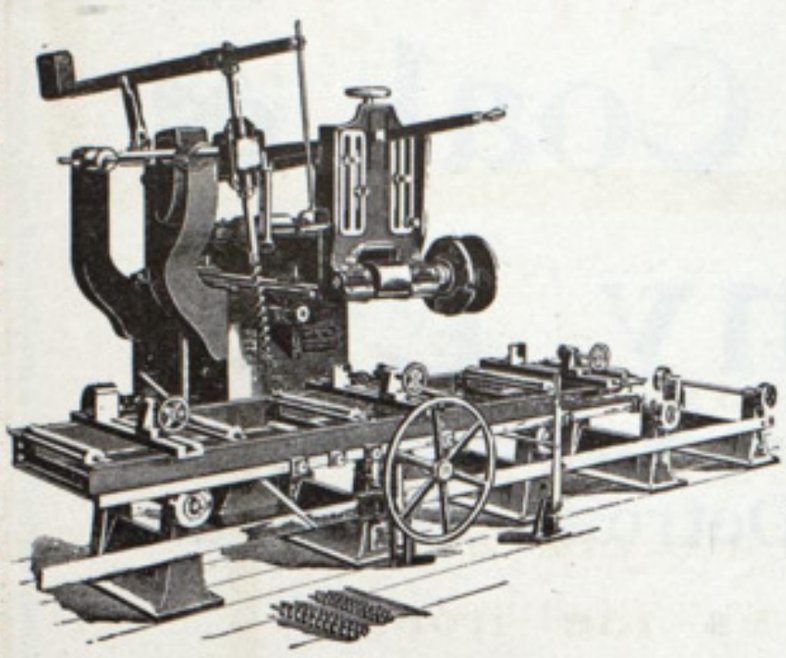
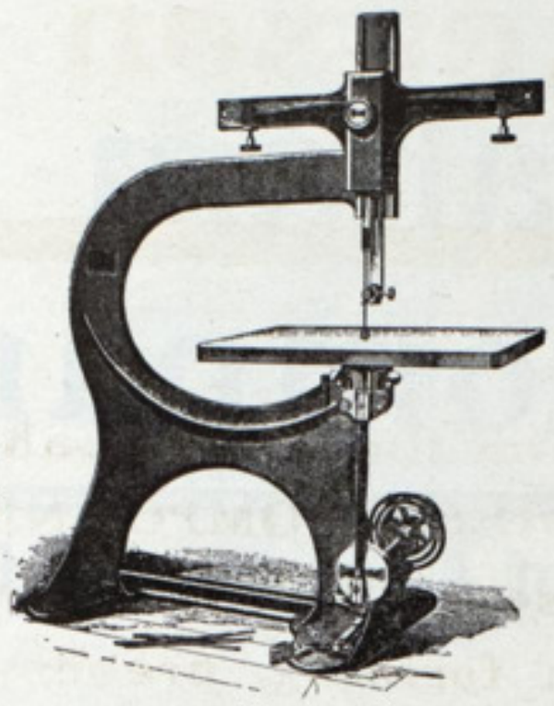
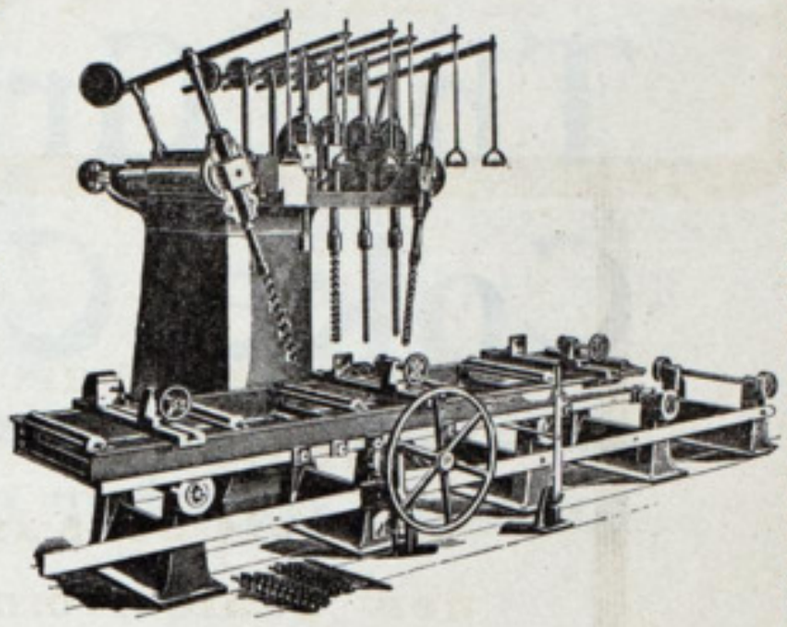
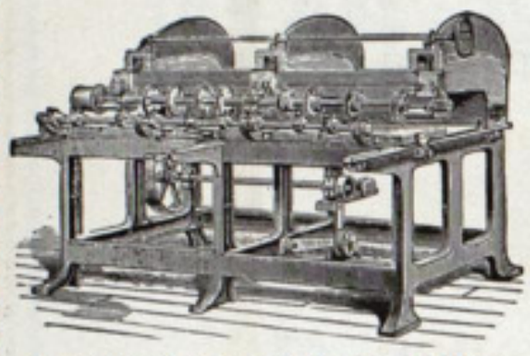
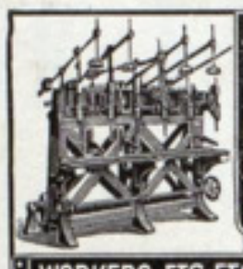








Gang Grooving and Gaining Machine.



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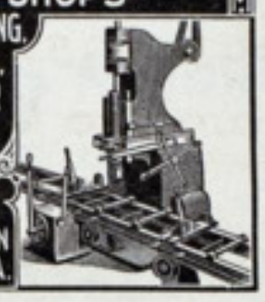
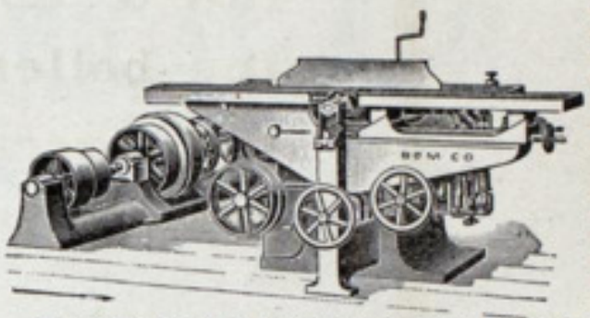
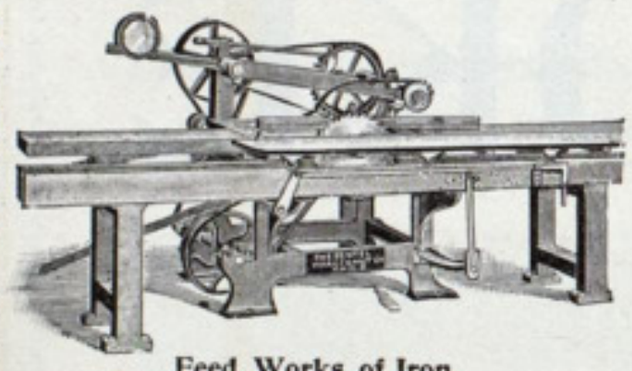
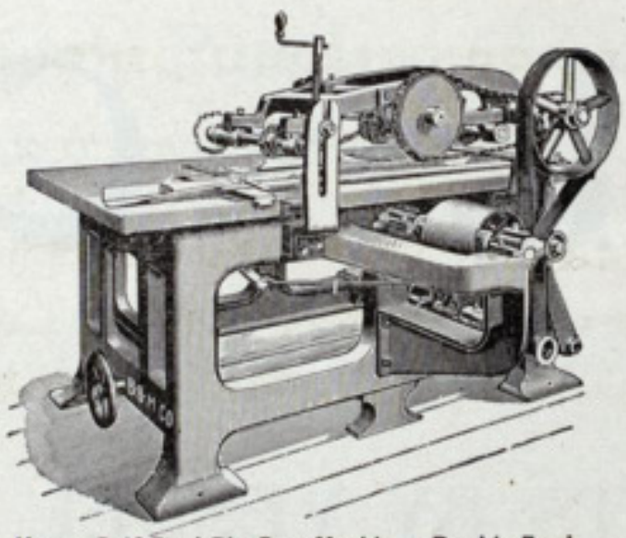




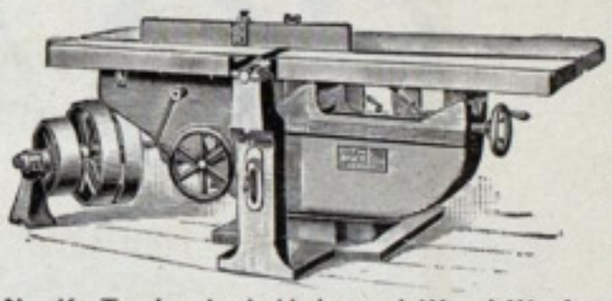
Wood Worker Side of Improved Heavy Ten-inch Climax Universal Wood Worker and Ten-inch Moulder Combined.



Feed Works of Iron Frame Rip and Edging Saw.



Heavy Self Feed Rip Saw Machine—Double Feed.



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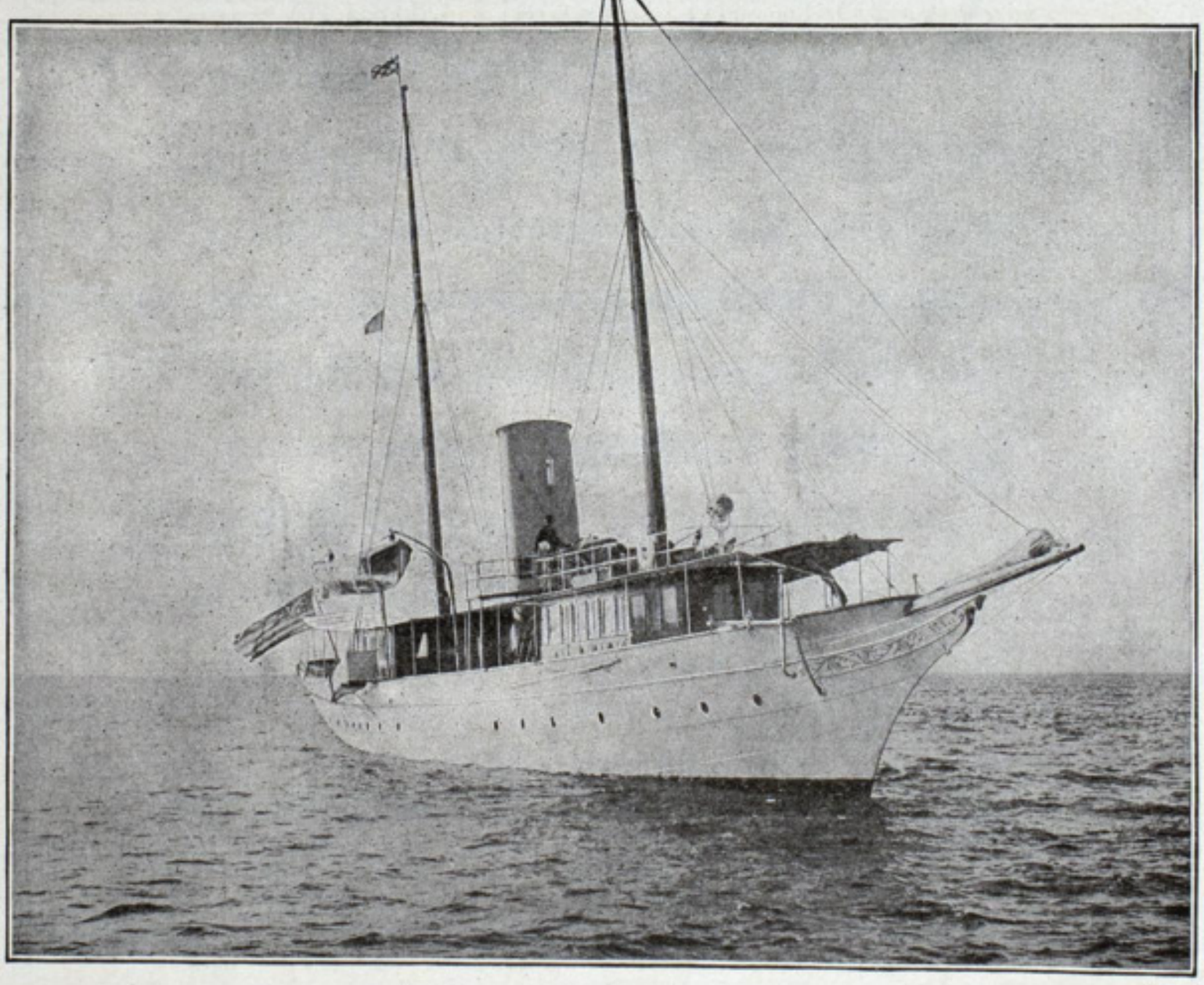

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It costs to use a Scientifically-made preparation but a trifle per day and saves the owner of the vessels an enormous amount in coal and steam plant repairs.

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STEEL SHIPS FOR THE LAKES VALUED AT $13,491,500.

The value of sixty-two vessels, building or under order in ship yards of the great lakes for delivery during the coming season of navigation, most of them before July next, is $13,491,500. All but one, a tow barge building at Bay City, Mich., are steel, steam vessels. The orders of the American Ship Building Co. (combination) are thirty-nine in number, of 186,750 gross tons carrying capacity, and valued at $9,565,000, while yards outside of the combination have orders for twenty-three vessels, valued at $3,926,500, and the freighters in this list of twenty-three are of 44,200 gross tons carrying capacity. With few exceptions, the list is made up of the largest type of ore, coal and grain carriers. In a season admitting of twenty trips, running up the lakes without cargo and bringing down iron ore or grain, which is a common practice, the new freighters, capable of carrying in one trip 230,950 gross tons, would move 4,619,000 gross tons. For fifteen years past, since steel vessels began to replace the smaller wooden craft on the lakes, the end has been looked for—ships tied to the docks with nothing to do—but the movement of iron ore and other bulk freight, to which these great hulls are so well adapted, keeps on increasing at such a high rate that all records of the past seem very small when compared with the present volume of orders for new vessels.

The array of big freighters in the American Ship Building Co.'s thirty-nine orders, footing up $9,565,000, is certainly wonderful. One car ferry and a passenger steamer do not go far towards relieving the monotony of the list. As an example of similarity of construction, which is one of the specializing features that has led to success in the lake trade, it is noted that one order, that of J. C. Gilchrist of Cleveland, is for eight steamers of 6,200 gross tons capacity each, that are exact duplicates in every way. Mr. Gilchrist goes further and duplicates this same type of vessel in two others, to be built by the Columbia Iron Works of Port Huron. Mr. A. B. Wolvin, general manager on the lakes for the United States Steel Corporation, appears as the owner of thirteen of the new vessels. Ten of these are of Canadian canal dimensions, and are for the great lakes and St. Lawrence transportation enterprise recently promoted by Mr. Wolvin. The other three are very large lake carriers, building for Mr. Wolvin and associates, who have profited by bringing out new vessels every year for some time past. In the line of big orders, W. W. Brown of Cleveland comes next with six modern steamers, and G. A. Tomlinson of Duluth follows with three. Twenty-two of the steamers are to have Ellis & Eaves draft and two Howden draft. Seven will have Babcock & Wilcox water-tube boilers.

Building at the Several Yards of the American Ship Building Co. of Cleveland.

To be built at	Type.	Dimensions in feet. Over all.	Keel.	Beam.	Depth.	Dimensions of Engines.	Boilers—Dimensions in feet and inches.	Draft.	Steam pressure pounds	Capacity, gross tons.	Value.	For whom building.
Cleveland..	Car ferry.	350	338	56	19½	23½, 37, 62x36 (2).....	Six Scotch, 13-9x12	Natural.....	175	....	$400,000	Manistq., Marq & Nor. Ry.
Cleveland..	Cargo stmr .	374	354	48	28	20, 33½, 55x40	Two Scotch, 12-10x13....	Natural	175	5,000	230 000	Mack estate, Cleveland.
Cleveland..	Cargo stmr.	400	380	50	28	22, 35, 58x40	Three Scotch, 12x12.....	Natural	180	5,600	250,000	H. Steinbrenner, Cleveland
Cleveland.	Cargo stmr..	436	416	50	28	20, 33½, 55x40.	Two Scotch, 13-2x11-6 ...	Ellis & Eaves .	170	6,200	275,000	G. A. Tomlinson, Duluth.
Cleveland.	Cargo stmr..	436	416	50	28	22, 35, 58x40..	Two Scotch 13-2x11-6 ...	Ellis & Eaves..	170	6 200	275,000	J. C Gilchrist, Cleveland.
Lorain	Cargo stmr.	436	416	50	28	22, 35, 58x40.....	Two Scotch 13-2x11-6....	Ellis & Eaves..	170	6 200	275,000	J C. Gilchrist, Cleveland.
Lorain	Cargo stmr .	436	416	50	28	22, 35, 58x40.....	Two Scotch, 13-2x11-6 ...	Ellis & Eaves..	170	6,200	275,000	J C Gilchrist, Cleveland.
Lorain	Cargo stmr..	436	416	50	28	22, 35, 58x40..	Two Scotch, 13-2x11-6	Ellis & Eaves..	170	6,200	275,000	J C Gilchrist, Cleveland.
Lorain	Cargo stmr.	434	414	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6...	Ellis & Eaves .	170	6 200	275,000	H. A. Hawgood, Cleveland
Lorain	Cargo stmr..	434	414	50	28	22, 35, 58x40	Two Scotch, 13-2x11-6 ..	Ellis & Eaves .	170	6,200	275,000	W. W Brown, Cleveland.
Lorain . ,...	Cargo stmr..	400	380	50	28	22, 35, 58x40.	Two Scotch, 13-2x11-6....	Ellis & Eaves .	170	5,600	260,000	W. W Brown, Cleveland.
Lorain	Cargo stmr..	400	380	50	28	22, 35, 58x40	Two Scotch, 13-2x11-6. ..	Ellis & Eaves .	170	5,600	260 000	W. W Brown, Cleveland.
Lorain	Cargo stmr..	400	380	50	28	22, 35 58x40.	Two Scotch, 13-2x11-6....	Ellis & Eaves .	170	5.600	260 000	W. W. Brown, Cleveland.
Chicago ...	Cargo stmr..	400	380	50	28	22, 35, 58x40	Two Scotch, 13-2x11-6....	Ellis & Eaves.	170	5,600	260.000	W. W Brown, Cleveland.
Chicago ...	Cargo stmr..	390	370	48	28	20, 33½ 55x40	Two Scotch, 12-6x11-6 ..	Ellis & Eaves .	170	5,250	250 000	W W. Brown Cleveland.
Chicago ...	Cargo stmr..	255	241	41	18	15, 25, 42x30.	Two Scotch, 11x11.	Natural....	170	†2,200	150 000	A. B. Wolvin, Duluth.
Chicago ...	Cargo stmr..	255	241	41	18	14, 25 42x30.....	B & W. water-tube. ..	... .	225	†2,200	150.000	A. B Wolvin, Duluth.
Chicago ...	Cargo stmr..	255	241	41	18	14, 25, 42x30	B & W. water-tube.....	... ...	225	†2 200	150 000	A, B Wolvin, Duluth.
Chicago ...	Cargo stmr..	436	416	50	28	22, 35 58x40	Two Scotch. 13-2x11-6	Ellis & Eaves .	170	6,200	275.000	J. C Gilchrist, Cleveland.
Chicago ..	Cargo stmr..	436	416	50	28	22, 35, 58x40	Two Scotch, 13-2x11-6 ...	Ellis & Eaves..	170	6,200	275 000	J C Gilchrist, Cleveland.
Chicago ...	Pckg. frtr ...	401	381	50	30	20¾ 30 43½, 63x42 ..	Three Scotch, 12-6x11-6..	Howden..	210	5,600	290 000	Western Trans. Co., Buffalo.
Detroit.....	Pass stmr....	362	340	45	28	22 31½ 45 65x42	Four Scotch, 12-6x11-6...	Howden.....	210	3,500	350,000	Anchor Line, Buffalo.
Detroit...	Cargo stmr..	255	241	41	18	15, 25, 42x30	Two Scotch, 11x11.....	Natural.....	170	†2,200	150 000	A. B Wolvin, Duluth.
Detroit.....	Cargo stmr .	255	241	41	18	15, 25, 42x30	Two Scotch, 11x11.....	Natural.....	170	†2,200	150,000	A B. Wolvin, Duluth.
Detroit.....	Cargo stmr..	255	241	41	18	15, 25, 42x30	Two Scotch, 11x11. ...	Natural.. ...	170	†2,200	150 000	A. B. Wolvin, Duluth.
Detroit.....	Cargo stmr..	468	448	52	28	15, 23¾ 36½, 56x40	B & W water-tube. ...	.....	250	6,900	315,000	A. B. Wolvin, Duluth.
Detroit.....	Cargo stmr..	436	416	50	28	22 35, 58x40	Two Scotch, 13-2x11-6 ...	Ellis & Eaves..	170	6 200	275.000	M. J. Cummings Oswego.
Bay City...	Cargo stmr..	376	356	50	28	20, 33½, 55x40.....	Two Scotch, 12-6x11-6....	Ellis & Eaves..	170	5,000	230 000	C W Elphicke Chicago.
Bay City...	Cargo stmr..	436	416	50	28	20, 33½, 55x40...	Two Scotch, 13-2x11-6....	Ellis & Eaves..	170	6,200	275,000	G. A. Tomlinson. Duluth.
Bay City...	Cargo stmr..	436	416	50	28	20, 33½, 55x40.....	Two Scotch. 13-2x11-6....	Ellis & Eaves .	170	6,200	275.000	G. A. Tomlinson Duluth.
Bay City...	Cargo stmr..	436	416	50	28	22, 35, 58x40	Two Scotch, 13-2x11-6....	Ellis & Eaves .	170	6 200	275 000	J. C. Gilchrist, Cleveland.
Bay City...	Cargo stmr..	436	416	50	28	22, 35 58x40	Two Scotch, 13-2x11-6	Ellis & Eaves.	170	6,200	275.000	J. C. Gilchrist, Cleveland.
Superior ..	Cargo stmr..	255	241	41	18	14, 25, 42x30	B & W. water-tube.....	.....	225	†2,200	150,000	A. B Wolvin, Duluth.
Super or...	Cargo stmr..	255	241	41	18	14, 25, 42x30	B & W. water-tube.....	....	225	†2,200	150,000	A. B Wolvin, Duluth.
Superior...	Cargo stmr..	468	448	52	28	15, 23¾, 36½ 56x40....	B & W. water-tube.	.....	250	6,900	315,000	A. B. Wolvin, Duluth.
Superior...	Cargo stmr.	468	448	52	28	15, 23¾, 36½ 56x40.....	B. & W. water-tube.....	....	250	6 900	315.000	A. B. Wolvin, Duluth.
Buffalo.....	Cargo stmr..	255	241	41	18	15, 25, 42x30	Two Scotch, 11x11..	Natural.....	170	†2.200	150.000	A. B Wolvin, Duluth.
Buffalo.....	Cargo stmr..	255	241	41	18	15, 25, 42x30	Two Scotch 11x11..... .	Natural	170	†2,200	150 000	A. B Wolvin, Duluth.
Buffalo. ...	Cargo stmr.	374	354	48	28	20, 33½, 55x40	Two Scotch, 14x12..	Natural	170	4 900	230.000	J. J. McWilliams, Buffala.
										186,750	$9,565,000	
Building at Works of Craig Ship Building Co., Toledo, O.												
Toledo.....	Cargo stmr..	380	...	50	28	21, —, —x—	Two Scotch, 11½x—.....	Natural.....	170	5,000	$245 000	Young Trans. Co.
Toledo	Cargo stmr..	404		50	28	Trip. exp.....	Two Scotch	Natural.....	170	5,600	265 000	Monroe Trans. Co.
Toledo.....	Car ferry ...	315	.....	52	38	Two trip.exp.	Eight Scotch	Natural ..	170	.. ..	340 000	Grand Trunk Car Ferry Co.
Toledo.....	Pass. stmr ..	245	....		.....	Trip exp	Rob water tube		.....	....	215,000	Dunkley-W'ms. Co., S Hav.
Building by Bertram Engine Works Co., Toronto, Ont.												
Toronto ...	Paddle stmr.	343	332	43	15	Incl. triple. 32, 53, 88x78	Six Scotch, 11x12.....	Howden.....	180	.....	$350.000	Richelieu & Ont. Nav. Co.
Toronto ...	Cargo stmr..	260	247	43	25	Trip exp., 17, 28, 46x32	Two Scotch 11-6x12.....	Natural	176	†2 300	160.000	A syndicate.
Toronto ...	Tow stmr....	146	139	26	8½	Incl. comp.. 24, 48x60..	Two loc. 5-4x23-4.....	Natural ...	130	.....	120,000	Upper Ott. Imp Co., Ottaw.
Toronto ...	Tow stmr ...	140	133	24	8	Incl. comp., 20, 38x54..	Two loc. 4-10x21.....	Natural.....	130	.....	120,000	Upper Ott. Imp Co., Ottaw.
Building by Columbia Iron Works, Port Huron, Mich.												
St. Clair...	Cargo stmr..	436	416	50	28	22, 36. 60x40	Two Scotch, 13-2x12	Ellis & Eaves .	170	6,200	$265,000	J. C. Gilchrist, Cleveland.
St Clair...	Cargo stmr..	436	416	50	28	22, 36, 60x40.....	Two Scotch. 13-2x12.....	Ellis & Eaves	170	6,200	265 000	J. C. Gilchrist Cleveland.
St. Clair...	Cargo stmr .	217	200	39	16	16, 26, 44x36.....	Two Scotch, 12x10-6.....	Natural	180	2,000	100,000	Iroquois Trans. Co., Chicago
St Clair...	Cargo stmr..	242	225	39	16	16, 26, 44x36..	Two Scotch, 12x10-6	Natural	180	2,200	125,000	T. J. Brindiville Chicago.
Building at Works of Jenks Ship Building Co., Port Huron, Mich.												
Port Huron	Pass stmr..	275	265	38	23	(2) 21, 34, 56x30..	Four Scotch, 13-6x12-6...	Natural.....	....	.....	$275,000	Michigan S S Co , S Haven
Port Huron	U. S. stmr...		160	28	14	22, 42x36	Two Scotch, 11-6x11....	Natural..	.....	.....	107,500	U S Eng at Milwaukee.
Building at Works of Collingwood Ship Building Co., Collingwood, Ont.												
Collingw'd	Cargo stmr..	375	358	48	28	20 33, 55x40..... ...	Two Scotch, 14x12. ..	Natural.....	180	4,900	$235 000	J Playfair. Midland Ont.
Collingw'd	Cargo stmr..	375	358	48	28	20, 33, 55x40.....	Two Scotch, 14x12.	Natural.. .	180	4,900	235,000	J H G. Hagerty, Toronto.
Building by Polson Iron Works, Toronto, Ont.												
Toronto ...	Light ship...	125	112	28½	15	Simple 23x22.....	Two navy pipe, 9x16 7'...	....	100	.. ....	$125,000	Canadian Government.
Toronto ...	Light ship...	125	112	28½	15	Simple 23x22.....	Two navy pipe, 9x16 7 ..	.....	100	. .	125,000	Canadian Government.
Building by James Davidson, Bay City, Mich.												
Bay City...	Tow barge ..	...	360	46	26	....	....	... ...	.....	4 900	$110 000	Builder's account.
Bay City ..	Tug	70	...	17	....	Steeple comp	....	... ...	.. ..	.....	9,000	Builder's account.
Building by Ship Owners' Dry Dock Co., Chicago.												
Chicago ...	Fireboat	118	107	24	13	Double 20x20.....	Two Scotch, 12x11½....	Natural.....	140	.....	$115,000	City of Milwaukee.
Building by Johnston Bros., Ferrysburg, Mich.												
Ferrysburg	Tug	68	58	17	9	High press 17x20	Fire Box, 6-4x12-2.....	Natural.....	150	.....	$10,000	Buffalo Dredg. Co., Buffalo.
Ferrysburg	Tug .....,	68	58	17	9	High press 18x20.....	One Scotch, 8x12	Natural.....	160	.....	10 000	Graham & Morton. Chicago.
										44,200	$3,926,500	

†On 14 ft. draught; all others based on 18 ft. draught.

Merchant Ship Building in Coast Ship Yards.

The William Cramp & Son Ship & Engine Building Co., Philadelphia.:

Single screw steel steamer, oil carrier Col. E. L. Drake, for the Standard Oil Co.; length, 360 ft.; single triple-expansion engines; two steel Scotch boilers.

Twin-screw bay steamboat (New York to Atlantic Highlands) for the Central Railroad of New Jersey; 297 ft. 3 in. long; two sets engines, triple-expansion; Scotch boilers.

Single screw steel steamer for coastwise service, an exact duplicate of steamer Huron just delivered to owners, for William P. Clyde & Co.; length, 300 ft.; one three-cylinder triple-expansion engine; two single-ended boilers of the return-tube, cylinder marine type.

See naval table for naval work. This company is also building a cruiser for the Turkish government.

New York Ship Building. Co., Camden, N. J.:

Cargo and passenger steamers Massachusetts and Mississippi for the Atlantic Transport Co. of New York, duplicates; 505 ft. 6 in. long; 8,100 gross tons; twin-screw, triple-expansion engines; four Scotch boilers; 5,000 H. P.

Cargo and passenger steamers Minnekahda and Minnelora for the Atlantic Transport Co., duplicates; 13,370 gross tons; 615 ft. 3 in. long; quadruple-expansion engines; eight Scotch boilers; 10,000 H. P.

Oil steamer Legonier and oil steamer No. 10 for the J. M. Guffey Petroleum Co. of Pittsburg, duplicates; length 375 ft. 5 in.; gross tonnage 3,660; triple-expansion engines; two Scotch boilers; 2,500 H. P.

Oil barges Nos. 11 and 12 for the J. M. Guffey Petroleum Co. of Pittsburg, duplicates; 134 ft. long; 220 gross tons.

Newport News Ship Building & Dry Dock Co., Newport News. Va.:

Single-screw steamship Monroe for the Old Dominion Steamship Co.; 366 ft. over all; triple-expansion engine; six Scotch boilers; 4,500 H. P.

Lumber steamer Francis H. Leggett for the Hammond Lumber Co.; 259 ft. long; triple-expansion engine; two Scotch boilers; 1,100 H. P.

Oil steamer for the Saginaw Steel Steamship Co.; 399 ft. long; triple-expansion engine; three Scotch boilers; 2,500 H. P.

For naval contracts see naval table.

The Neafie & Levy Ship & Engine Building Co., Philadelphia.:

Ocean tug Honeybrook for the Central Railroad of New Jersey; 135 ft. long; triple-expansion engine; one Scotch boiler; 800 H. P.

Ocean tugs Nos. 14 and 15 for the Standard Oil Co.; each 100 ft. long; compound engine; one Scotch boiler; 475 H. P.

Harbor tugs Radiant and Brilliant for the Standard Oil Co.; each 80 ft. long; compound engine; one Scotch boiler; 250 H. P.

Ocean tug Gulfport for the Texas & Gulf railroad; 112 ft. long; compound engine; one Scotch boiler; 550 H. P.

Ferry boat Ocean City for the Philadelphia & Reading railway; 156 ft. long; single jet condensing engine; lobster-back boiler; 650 H. P.

Passenger and freight side-wheel steamer Middlesex for the Weems Steamboat Co., Baltimore, Md.; 207 ft. long; inclined compound engine; two Scotch boilers; 1,300 H. P.

Machinery for ocean tug Paul Jones; triple-expansion engine; two Scotch boilers; 1,600 H. P.

Ocean tug for New York parties; 109 ft. long; compound engine; one Scotch boiler; 550 H. P.

This company also has three other tugs under way. Its total horse-power at present under construction is 27,000; its total output of horse-power in 1902 for merchant work only was 12,852.

Fore River Ship & Engine Co., Quincy, Mass.:

Passenger steamer for the Fall River Line; 397 ft. over all; cost $1,000,000; two inclined compound engines; Scotch boilers; 5,500 H. P.

Freight steamer for the Fall River Line; triple-expansion engines; Scotch boilers; cost $450,000.

Six-masted steel schooner for Capt. J. G. Crowley and others; 339 ft. long.

For naval work see naval table.

Crescent Ship Yard, Elizabethport, N. J.:

Tampico and Vera Cruz, two twin screw gunboat troopships for the Republic of Mexico; 201 ft. 6 in. long; two triple-expansion engines, 14, 22 and 36 in. diameter by 24 in. stroke; two Mosher water-tube boilers; 2,200 H. P.

Czarina, steam yacht for Charles F. Bryan of New York; 166 ft. 3 in. long; one triple-expansion engine, 14, 22 and 36 by 24; two Mosher water-tube boilers; 1,200 H. P.

Eurana, paddle steamer for Charles M. Schwab of New York; 211 ft. long; engines building by W. & A. Fletcher Co., Hoboken, N. J.

Steam launch for Brazil; 30 ft. long; one compound engine, 4 and 8 in. by 5 in. stroke; one Roberts' boiler; 25 H. P.

Ferry steamer for the Central Railroad of New Jersey; 207 ft. long; one triple-expansion engine 19, 30 and 35 by 30; three gunboat boilers, 8 ft. 9 in. diameter by 20 ft. long; 1,800 H. P

Approximate value of all craft $1,250,000.

For naval work see naval table.

Union Iron Works, San Francisco, Cal.:

Steel freight steamer Arizonian for American-Hawaiian Steamship Co. of New York; 486 ft. long; cost $850,000; twin-screw quadruple-expansion engine; three Scotch boilers with Howden's draft; 3,000 H. P.

Steel oil tank steamer No. 82 for Union Oil Co. of San Francisco; 251 ft. long; cost $220,000; twin-screw triple-expansion engine; two Scotch boilers.

For naval work see naval table.

Maryland Steel Co., Sparrow's Point, Md.:

Twin-screw freight steamships Missouri and Maine for the Atlantic Transport Co. of New York, duplicates; 507 ft. long; triple-expansion engines and Scotch boilers; 5,500 H. P.

Passenger and freight steamer Virginia for the Baltimore, Chesapeake & Atlantic Ry. of Baltimore, Md.; 188 ft. 4½ in. long; beam engine; one leg boiler.

This company is also supplying a new set of boilers for the N. Y. P. & N. steamer New York, and the Merchant & Miners' Transportation Co.'s steamer Gloucester.

Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.:

Steam composite yacht Cherokee for S. H. Vandergrift; 115 ft; Seabury triple-expansion engine and one Seabury boiler.

Wooden steam yacht Inia for H. S. F. Davis; 103 ft. long; Seabury triple-expansion engine and one Seabury boiler.

Steel steam yacht Aria for E. H. Blake; 165 ft. long; Seabury triple-expansion engine and one Seabury boiler.

Wooden steam yacht Corinthia for J. A. Mollenhauer; 90 ft long; two Seabury triple-expansion engines; one Seabury boiler.

Wooden yacht for H. B. Gilbert; 65 ft. long; one Seabury triple-expansion engine and one Seabury boiler.

Wooden yacht Myhisana for M. Goldsmith; 54 ft. long; one Seabury compound engine and one Seabury boiler.

Yacht Velthra for S. Parker Bremer; 110 ft. long; two Seabury triple-expansion engines and one Seabury boiler.

Wooden yacht Niagara IV. for Howard Gould; 110 ft. long; two Seabury triple-expansion engines and one Seabury boiler.

Wooden yacht for W. E. Duryea; 65 ft. long; one Seabury triple-expansion engine and one Seabury boiler.

Wooden yacht for Alfred Marshall; 90 ft. long; one Seabury triple-expansion engine and one Seabury boiler.

William R. Trigg Co., Richmond, Va.:

Revenue cutter Mohawk; length 205 ft.; cost $210,000; triple-expansion engines and four Scotch boilers; 2,400 H. P.

Sea-going dredge Benyuard for the war department; length, 375 ft.; cost $300,000; two compound engines and four Scotch boilers; 1,300 H. P.

Tank steamer Capt. A. F. Lucas for the Standard Oil Co.; length 272 ft.; cost $450,000; triple-expansion engine; two Scotch boilers; 2,000 H. P.

Ferryboats Bristol and Chester for the Pennsylvania railway; 105 ft. long each; compound engine; one Scotch boiler.

Tug Cape Charles for the N. Y. P. & N. Ry.; 122 ft. long; cost $75,000; compound engine and Scotch boiler.

Townsend & Downey Ship Building & Repair Co., Shooter's Island, N. Y.:

Two bulk oil steel barges for the Standard Oil Co.; length, 375 ft.; cargo capacity 2,000,000 gallons.

Steel tug boat Cornell for the Cornell Steamboat Co.; length, 150 ft.; machinery to be supplied by owners.

Lighthouse tender Crocus; length, 164 ft. 7 in.; twin-screw compound engine; two straight tube boilers of the gunboat type.

Two-masted auxiliary steel schooner yacht for John W. Mason; single-screw 60 H. P. Globe gasoline engine.

Three-masted auxiliary steel schooner yacht for Wilson Marshall; 185 ft. long; compound engine; pair of Almy water-tube boilers; 33 H. P.

Twin-screw ferryboat for Townsend & Downey; 100 ft. long; one high-pressure engine and Scotch boiler.

Burlee Dry Dock Co., Port Richmond, S. I.:

Steel steam yacht Noma for W. B. Leeds of New York; 226 ft. long; two four-cylinder, triple-expansion engines and six Almy water-tube boilers; 3,800 H. P.

United States lighthouse tender Sumac; 160 ft. long; two compound engines and two gunboat boilers; 750 H. P.

United States lignthouse tender Sumac; 160 ft. long; two compound engines and three Scotch boilers; 700 H. P.

United States lightship No. 76; 117 ft. 7 in. long; one compound engine and two gunboat boilers; 450 H. P.

Three oil barges for the Standard Oil Co., two of them 155 ft. 8 in. long and one 300 ft. long.

Propeller Shohola for the Erie railway; to be equipped with one Scotch boiler 11 ft. 6 in. in diameter and 11 ft. 6 in. long.

Lighter America for F. Verdon Co., New York; to be equipped with one flue and return tubular boiler 7 ft. in diameter and 14 ft. long.

This firm is also building a triple-expansion engine for the Bucyrus Co. of South Milwaukee, Wis.

Harlan & Hollingsworth Co., Wilmington, Del.:

Two steamships for the Baltimore & Philadelphia Steamboat Co., (Ericsson Line), duplicates; 203 ft. long; four-cylinder, triple-expansion engines.

Auxiliary yacht for Mr. Albert C. Bostwick of New York; 162 ft. long.

Passenger steamer for the Eastern Steamship Co.; about 400 ft. long.

Roach's Ship Yard, Chester, Pa.:

Passenger and freight steamer for the Mallory Line of New York; 400 ft. long.

Passenger steamer for the Ocean Steamship Co. of Savannah; 400 ft. long.

Bath Iron Works, Bath, Me.:

Oil barge for the J. M. Guffey Petroleum Co., nearly completed, also caisson for the Kittery navy yard.

For naval work which is important at this yard see naval table.

George Lawley & Sons Corporation, South Boston, Mass.:

Steel steam yacht for Charles Fletcher, Providence, R. I.; 168 ft.; cost $140,000; four-cylinder, triple-expansion engine and two modified Normand boilers.

Steel steam yacht for Charles G. Emery of New York; 140 ft. long; cost $90,000; four-cylinder, triple-expansion engine; one modified Normand type water-tube boiler.

Baltimore Ship Building & Dry Dock Co., Baltimore, Md.:

Two coal barges for the New York Weighing Barge & Coaling Co., New York; 144 ft. in length; 657 gross tons; special machinery to be supplied.

Lighthouse tender Magnolia for the United States Lighthouse board; 173 ft. 2 in. long; twin engines 18 and 34 by 26 in.; two Scotch boilers; 700 H. P.

Ten water-tube boilers of the Zell type for manufacturing plants; 4,038 H. P.

Spedden Ship Building Co., Baltimore, Md.:

Steel steamer Winnisimmet for the revenue cutter service; 96 ft. 6 in. long; triple-expansion engine with cylinders 13⅛, 21 and 32¼ in. in diameter with 24 in. stroke; Roberts boiler, 525 H. P.

Steel steamer Mackinac for the revenue cutter service; 110 ft. long; triple-expansion engine with cylinders 13⅛, 21 and 32¼ in. in diameter and 24 in. stroke; Roberts boiler; 525 H. P.

Steel steamer Juniper for the lighthouse service; 95 ft. 4 in. long; two engines, 12 in. by 12 in.; Roberts boiler; 150 H. P. each.

Steel hull No. 208 for stock account; 108 ft. long; engine 15 and 30 by 22 in.; Scotch boiler, 11 ft. by 11 ft.; 300 H. P.

Moran Bros. & Co., Seattle, Wash.:

Steel lighthouse tender Heather; 178 ft. 6 in. long; compound engine; two single-ended cylindrical boilers.

Steel tugs Bahada and Wyadda for the Puget Sound Tug Boat Co., Seattle, Wash.; 90 ft. long each; one compound engine; one single-ended cylindrical boiler.

Steamship Umatilla for the Pacific Coast Steamship Co., Seattle, Wash.; compound engine being rebuilt; three single-ended cylindrical boilers 14 ft. 6 in. diameter and 12 ft. long, one single-ended cylindrical boiler 9 ft. 6 in. diameter and 9 ft. 8 in. long.

This company is also putting cylindrical boilers into the following vessels: Cottage City of the Pacific Coast Steamship Co.; Mainlander of Cook & Co., Seattle, Wash.; steamer George E. Starr of LaConner Trading & Transportation Co., Seattle, Wash; Oregon of the White Star Steamship Co., Seattle, Wash.

The company is also building a new floating dry dock, and a derrick of 100 tons capacity.

See naval table for naval work.

Perth Amboy Ship Building & Engineering Co., Perth Amboy, N. J.:

Schoolship Young America for the Nautical Preparatory School; 262 ft. long; full-rigged sailing ship with auxiliary steam power.

American Car & Foundry Co., Jackson & Sharp plant, Wilmington, Del.:

Six car floats for the Pennsylvania Railroad Co. of New Jersey; each 250 ft. long.

Elevator hull for the International Elevating Co. of New York; 112 ft. long; machinery placed in New York.

Freight barge for George W. Bash & Sons Co., Wilmington, Del.; 117 ft. long.

Two dump scows for Dunbar & Sullivan, Buffalo, N. Y.; 110 ft. long.

United Engineering Works, Spear st., San Francisco, Cal.:

Steel steamer San Gabriel; 163 ft. long; cost $100,000; compound engine; two Scotch boilers; 450 H. P.

Wooden stern-wheel steamer, 120 ft. long; cost $20,000; compound engine; one locomotive boiler; 150 H. P.

Wooden tug, 72 ft. long; cost $20,000; compound engine; one Scotch boiler.

Wooden tug, 50 ft. long; compound engine; one Scotch boiler.

Wooden barge Gwenne for the Baltimore & Boston Barge Co. of Boston, Mass.; 225 ft. long; cost $40,000.

Wooden schooner for J. S. Emery & Co., Boston; 187 ft. long; cost $45,000.

Arthur Sewall & Co., Bath, Me.:

Five-masted steel schooner for Arthur Sewall & Co., Bath, Me.

Baltimore Marine Railway, Machine & Boiler Works, Philpot & Point streets, Baltimore, Md.:

Wooden steam yacht for John E. Hunt & Co., Baltimore, Md.; 125 ft. long; cost $38,000; triple-expansion engine and two class D. Almy water-tube boilers.

This firm is also building a 7 and 14 by 12 fore-and-aft compound engine.

J. S. Ellis & Son, Tottenville, Staten Island, N. Y.:

Tug boat for Russel Bros., Long Island City; 80 ft. long; cost $60,000; single engine.

Tug boat for Robert White of Brooklyn, N. Y.; 72 ft. long; cost $14,000; single engine.

Oyster boat H. C. Ellis for George Marshall, Prince's bay, Staten Island; 47 ft. long; cost $6,000; gasoline engine.

This firm expects to build a steam lighter, 135 ft. long, costing $24,000, to be equipped with compound engines, twin-screws and Roberts' boilers.

Crawford & Reid, Tacoma, Wash.:

Fishing steamer Lincoln for P. H. Buschman of Tacoma, Wash.; length, 80 ft.; cost $13,000; single engine; one pipe boiler.

Fishing steamer McKinley for P. H. Buschman of Tacoma, Wash.; length, 80 ft.; cost $13,000; single engine; one pipe boiler.

Tugs Falcon and Ely for Tacoma Tug & Barge Co.; 68 ft. long each; cost $10,000 each; single engine; Scotch marine boiler.

Tug Mitchell for Pacific Cold Storage Co., Tacoma, Wash.; length, 55 ft.; cost $4,000; one White gasoline engine.

Scow for the Tacoma Tug & Barge Co.; 90 ft. long; cost $3,000.

Tug Irene for the Pacific Tug Co., Seattle, Wash.; 80 ft. long; cost $17,000; one compound engine; Scotch marine boiler.

Fishing steamer Bertha for Ollard & Bowden, Tacoma, Wash.; 65 ft. long; cost $6,000; triple-expansion engine with pipe boiler.

Fishing steamer Mariner for Ollard Bros., Tacoma, Wash.; 88 ft. long; cost $18,000; compound engine and Scotch marine boiler.

Hall Bros., Port Blakeley, Wash.:

Wooden schooner Mabel Gale for Swett & Loop, San Francisco; 200 ft. long; cost $60,000.

Wooden schooner No. 108 for Hall Bros. of San Francisco; 240 ft. long; cost $80,000.

H. D. Bendixen Ship Building Co., Eureka, Cal.:

Four-masted schooner Borealis for R. J. Tyson & Co., San Francisco, Cal.; length, 215 ft.; approximate cost $55,000.

Two barges for Franklin P. Bull of San Francisco; 120 ft. long; approximate cost $4,000 each.

Two lighters for local parties; length, 75 ft.; approximate cost $1,500.

The R. Palmer & Son Ship Building Co., Noank, Conn.:

Wooden houseboat for E. W. Hooker, Hartford, Conn.; 130 ft. long; cost $32,000; triple-expansion engine; Almy water-tube boiler.

Tug boat for J. Van Wie, New York; 100 ft. long; cost $25,000; single engine 20x22; leg boiler 8½x16 ft.

Tug boat for Henry Crew of New York; 98 ft. long; cost $25,000; single engine 20x22; leg boiler 8x14 ft.

Passenger boat for the Huntington Steamboat Co.; 125 ft. long; compound engine and leg boiler.

Steamer for Elias Wilcox, Mystic, Conn.; 136 ft. long; cost $28,000; compound engine and leg boiler.

Steam lighter for Manhattan Lighterage Co. of New York; 106 ft. long; cost $20,000; single engine and leg boiler.

Peter Swanson, Belvedere, Cal.:

Wooden schooner for F. D. Spaulding of San Francisco; 68 ft. long; cost $7,000; Hercules gas engine; 45 H. P.

Launch for J. Hamilton of Central America; 50 ft. long; cost $4,000.

Speed launch, 19 ft. long; cost $700; for Hercules Gas Engine Works of San Francisco.

Hay & Wright, San Francisco, Cal.:

Hydraulic and clamshell dredge, 150 ft. long; also have contracts for several dump scows for the state of California.

Green Bros., Bridgeport, Conn.:

Oyster steamer Arthur J. for W. H. Cornwell, Baldwin's, Long Island; 43 ft. long; cost $3,500; Globe gas engine; 10 H. P.

Oyster steamer Sir Thomas for C. E. Bourner & Sons, Providence, R. I.; 41 ft. long; cost $4,000; Globe gas engine; 16 H. P.

Oyster steamer Martha J. Sutter for J. A. Sutter, Brooklyn, N. Y.; 50 ft. long; cost $5,000; fore-an-aft compound engine and upright boiler.

Yacht for John R. Sewell, 322 Broadway, N. Y.; length, 66 ft.; cost $7,000; Globe gas engine; 35 H. P.

Oyster steamer for W. I. Stevens, Rowayton, Conn.; 66 ft. long; fore-and-aft compound engine and upright boiler.

Oyster steamer for F. I. Hitchcock, Bridgeport, Conn.; 48 ft. long; cost $4,100; gas engine.

This firm has also several large repair jobs on hand and is figuring on a number of new contracts.

Joseph Supple, Portland, Ore.:

Wooden tug Major Guy Howard for quartermaster's department of the Columbia river; 90 ft. long; cost $23,000; fore and-aft compound engine and one Taylor water-tube boiler.

Wooden stern-wheel steamer for Lewiston Sound Navigation Co.; 125 ft. long; cost $20,000; single engine; two Scotch marine boilers.

Mr. Supple has completed his marine railway and added considerably to his plant.

Thames Towboat Co., New London, Conn.:

Towboat Paul Jones for the Thames Towboat Co., New London, Conn.; 187 ft. long; triple-expansion engine; two Scotch boilers; machinery building by Neafie & Levy, Philadelphia; 1,500 H. P.

Barge John Forsyth for the Thames Towboat Co., New London, Conn.; 297 ft. long; 46 ft. beam and 20 ft. deep.

W. Irving Adams, East Boothbay, Me.:

Wooden schooner Etta M. Burner for F. S. Willard and others; 67 ft. long; cost $6,000; gasoline engine.

Schooner for Ralph E. Dodge, Block Island, R. I.; 64 ft. long; cost $4,200.

Four-masted schooner for Capt. Andrew Adams and others of Portland, Me.; 210 ft. long; cost $55,000.

Washburn Bros., Thomaston, Me., write:

Building a five-masted wooden schooner of the following dimensions: Keel, 265 ft.; beam, 48 ft.; depth, 27 ft.; gross tonnage 2,300; cost $128,000. Having frames cut for two four-masted schooners of 200 ft. keel; 40 ft. beam and 19 ft. depth. These latter to be built next season. All to be managed by the builders.

Samuel Ayers & Son, Upper Nyack, N. Y., write:

"We have in course of construction nineteen yachts of the so-called 15-ft. one-design class for the Seawanhaka Corinthean Club, Oyster Bay, L. I., and also orders for a 38-ft., twin-screw. gasoline launch with torpedo stern for Mr. Charles Vermoral of Lodi, N. J."

F. S. Bowker & Son, Phippsburg, Me., write:

We have three three-masted schooners to build in 1903. One is for Capt. J. D. Eastman, 390 tons. She is for Pensacola parties. Another is for Capt. George Genkins of Jonesport, Me., 470 tons; and the third is for Capt. H. F. Sproul of Mobile, Ala., 390 tons.

The Pusey & Jones Co., Wilmington, Del.:

Two standard steel screw steamers for harbor service, quarter master's department, United States army; 110 ft. long; vertical, inverted, direct-acting, compound surface-condensing engine; Scotch boiler; 400 H. P.; approximate cost $56,000 each.

Jacobson & Peterson, Foot 24th st., Brooklyn, N. Y..

Tug boat for Valvoline Oil Co.; 90 ft. long; cost $15,000; naphtha engine.

Two scows for Phœnix Towing & Transportation Co.; 105 ft. long; cost $6,000 each.

Eastern Ship Building Co., New London, Conn.:

Two steel cargo and passenger steamers for the Great Northern Steamship Co.; length, 630 ft.; cost $2,500,000; triple-expansion engines; sixteen Niclausse boilers; 10,000 I. H. P.

P. L. Colon, Steam Marine Railway, Jersey City, N. Y.:

Steam lighter for the Staten Island Sand Transportation Co.; length, 95 ft.; cost $17,000; 230 H. P.

Barge for New York parties, 102 ft. long.

Perth Amboy Dry Dock Co., Perth Amboy, N. J.:

Two car floats with three tracks for the Bush company; 250 ft. in length; cost $25,000.

MARINE RURAL FREE DELIVERY.

The only marine rural free delivery service in the world is operated on Lake Winnipesaukee, New Hampshire. It is conducted under the supervision of Postmaster Charles E. Buzzell and is intended to supply the summer residents with mail facilities. The Dolphin, the mail delivery boat, was designed and built at Lakeport, N. H., by George H. Saltmarsh at an expense of $3,200. She is 43 ft. long over all, 38 ft. on the water line, 9 ft. 6 in. beam and draws 3 ft. 4 in. running. She is cabined over with glass windows aft of the engine room and is licensed to carry fifty persons. The machinery was supplied by E. L. Fitzhenry & Co. and James H. Paine & Son of Boston, Mass., and consists of a Fitzhenry fore-and-aft compound engine with cylinders 5 and 10 in. in diameter and 6 in. stroke, and an upright tubular boiler 40 in. drain by 4 ft. 9 in. high, containing 225

Only Marine Rural Free Delivery Boat in the World.

1½-in. tubes of 20 in. length, carrying a working pressure of 250 lbs. The first delivery was made on June 2, 1902, with George H. Saltmarsh as carrier and Archie L. Lewis as sub carrier. During July and August two trips per day were run and in the other months one trip per day. From June to November she ran 6,247 miles and delivered and collected 50,000 pieces of mail. Moreover she carried several thousand passengers and did a very large express and passenger parcels business and was altogether very successful.

ROBERT PALMER & SON, NOANK, CONN.

There is in process of construction at the yard of Robert Palmer & Son, Noank, Conn., five steamers, seven car floats and two lighter barges. If placed end to end these vessels would measure over half a mile in length, or to be exact 2,710 ft. The largest jobs on hand are the car floats. Three of them for the Central Railroad of New Jersey are each 265 ft. long, two for the Stavin Transportation Co. are 250 ft. long, two for the New York Central, one being 320 ft. long and the other 250 ft. long. Two lighter barges to be known as Madison and Monroe, are being built for the Manhattan Lighterage & Transportation Co. There is also being built for this same company a steam lighter of the following dimensions: Length, 128 ft.; beam, 34 ft.; depth, 11½ ft. The engine will be 21 by 26 in. and the boiler 8½ ft. in diameter by 6 ft. long. A steam houseboat, to be known as Rosalie, is being built for E. M. Hooker of Hartford. Conn. She will be 130 ft. long, 30 ft. beam and 6½ ft. deep. She will be equipped with triple-expansion engines 9, 15 and 23½ in. diameter of cylinders with stroke of 12 in. Steam will be supplied by an Almy water-tube boiler. A fishing steamer to be known as Leander Wilcox, is being built for the Mystic Fertilizer Co. of Mystic, Conn. She will be 137 ft. long, 22 ft. beam and 9 ft. deep. Her engine will be 15 and 30 by 22 in. and her boiler 8½ ft. in diameter by 14 ft. long. A tug, to be christened David B. Dearborn, is being built for J. H. Van Wie of New York. She will be equipped with a Sullivan engine, 20 by 26, and a boiler 8½ ft. in diameter by 16 ft. long. The tug Robert Palmer is being built for the White Star Towboat Co. of New York. She will have a Sullivan engine, 18 by 24, and a boiler 8 ft. in diameter by 14 ft. long. Both of these tugs will be modern in every respect.

Altogether Robert Palmer & Son completed and delivered twenty-one vessels in 1902.

Thomas C. Munn of Wilmington, Del., writes that he is building fifty galvanized steel life boats, 22 ft. each in length, for the great lakes; seven copper-fastened cedar boats, 20 ft. in length, for the government; two galvanized steel life boats, 18 ft. in length each, for the Pusey & Jones Co., Wilmington, Del.; two galvanized steel life boats, 16 ft. in length, for the W. & A. Fletcher Co., and two galvanized steel life rafts, 14 ft. in length each, for the W. & A. Fletcher Co.

The New Battleship Maine.

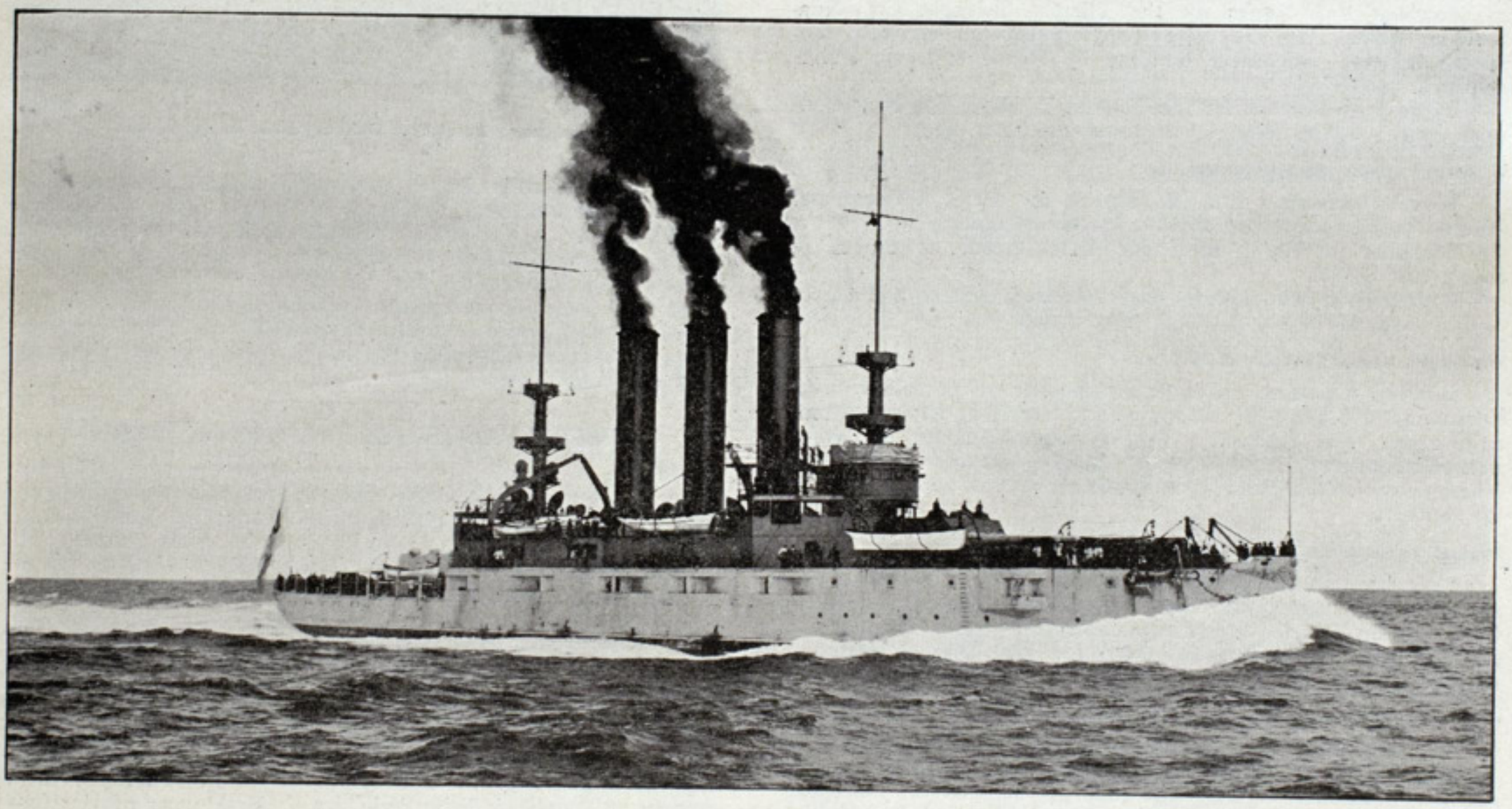
One of the types of the year in the warship line is the battleship Maine which was completed in the summer and underwent her trial trip in September last. On her trial trip she exceeded by a trifle her speed requirement of 18 knots. She is once again as big as her namesake, whose destruction led to the Spanish-American war. She went into commission during the present week. The leading particulars of the new Maine are:

Length on load water line	388 ft.
Breadth, extreme	72 ft. 2½ in.
Displacement at trial draught of 23½ ft	12,500 tons.
Freeboard, forward at the bow	20 ft.
Freeboard, aft at the stern	13 ft.
Height of axis of forward 12-in. turret guns above water	26½ ft.
Height of axis of after 12-in. turret guns above water	19 ft.
Height of axis of main-deck 6-in. R. F. broadside guns	15¼ ft.
Height of axis of upper-deck 6-in. R. F. broadside guns	23¾ ft.
Height of axis of machine guns in upper tops above water	76 ft.
Height of axis of machine guns in lower tops above water	60 ft.
Height of sight holes in conning tower above water	34½ ft.

The main battery consists of four 12-in. breech-loading rifled guns, and sixteen 6-in. rapid fire guns. The 12-in. guns are installed in two Hichborn balanced turrets, 11 in. thick, located on the center line and mounted in circular barbettes 12 in. thick, extending down to the protective deck. Twelve of the 6-in. guns are mounted in broadside on the main deck, two of which can also fire directly ahead. The remaining four 6-in. guns are mounted on the upper deck amidships on each side, two being able to fire directly ahead and two directly astern as well as on broadside. The secondary battery consists of twenty 6-pounders, six 1-pounders and four Gatlings, with one 3-in. rapid fire field gun. The 6-pounders and other secondary battery guns are located on the after berth deck, upper deck, bridges and in military tops. There are also two submerged torpedo tubes, one on each side, below the protective deck forward of the forward turret. The Maine carries eight 17-ft. torpedoes. They are the first underwater torpedoes introduced into the United States navy, though they are being used very generally in all battleships building abroad. The 6-in. guns are 40 caliber, with a muzzle velocity of not less than 3,000 ft. per second for the 12-in. guns.

The water line belt is 7½ ft. in depth, that is extending from 4 ft. below the water line to 3½ ft. above it, and from the stem to abreast the after side of the after barbette. The maximum thickness is 11 in., tapering from that thickness at 1 ft. below the water line to 7½ in. thick at the lower edge. It also tapers from the maximum thickness abreast the turret to 4 in. thick at the stem. Protection to the after end of the vessel is provided by a heavy protective deck made of 120-lb. plates. The casemate armor protecting all the 6-in. guns is 6 in. thick. There are also splinter bulkheads, in thickness 1½ in., located between the guns to localize any damage in action. The conning tower and shield are each 10 in. thick, with an armored tube 7 in. thick extending below to the protective deck. The signal tower is cylindrical in shape, 6 in. thick, and located forward of the after turret. The protective deck extends for the entire length of the vessel, the outer edge being 4 ft. below the water line. The lower course is of 40-lb. plates; the upper course on the flats 62½ lbs. and on the slopes 70 lbs., with 120-lb. plates aft over the steering gear. Protection is further assured by a cofferdam worked entirely around the vessel in the neighborhood of the water line, in which is packed between 40 and 50 tons of corn-pith cellulose.

A double bottom, built of ⅜-in. inner bottom plates, is worked the whole length of the machinery space and also under the magazines forward and aft. This space is sub-divided into numerous water-tight compartments, in order to localize any injury that may occur to the bottom of the vessel. These compartments are connected by means of pipes with the drainage and pumping systems of the vessel, so that water may be carried in these spaces for trimming purposes, or pumped out as required. Large and small, there are about 400 compartments, mostly water-tight, throughout the vessel. In addition to the protection given by the armor and cofferdams, the boilers and engines are surrounded by a deep body of coal, the bunker capacity being fully 2,000 tons, an unusually large quantity in a vessel of this size.



The New Cramp-built Battleship Maine on her Trial Trip.

[Photograph copyrighted by W. H. Rau, Philadelphia, Pa.

The motive power consists of triple-expansion, twin-screw propeller engines, with Niclausse water-tube boilers to indicate about 16,000 H. P., with assisted draft. The engines are vertical, three-cylinder, of a collective power of about 8,000 H. P. each. The working pressure in the boilers is about 256 lbs. per square inch and 200 lbs. per inch at the engines. The boilers are placed in water-tight compartments separated by middle line bulkhead. The diameter of the high-pressure cylinder is 38½ in., that of the intermediate cylinder 59 in. and the diameter of the low-pressure cylinder 92 in.; length of stroke of all pistons 42 in.; number of revolutions on trial between 122 and 130 per minute. The screw propellers are three-bladed, made of bronze and about 14½ ft. in diameter. The boilers are twenty-four in number, arranged in three groups. The total amount of heating surface is 58,104 sq. ft. and the grate surface 1,353 sq. ft. The smoke pipes are three in number, and in height about 90 ft. above the level of the grates.

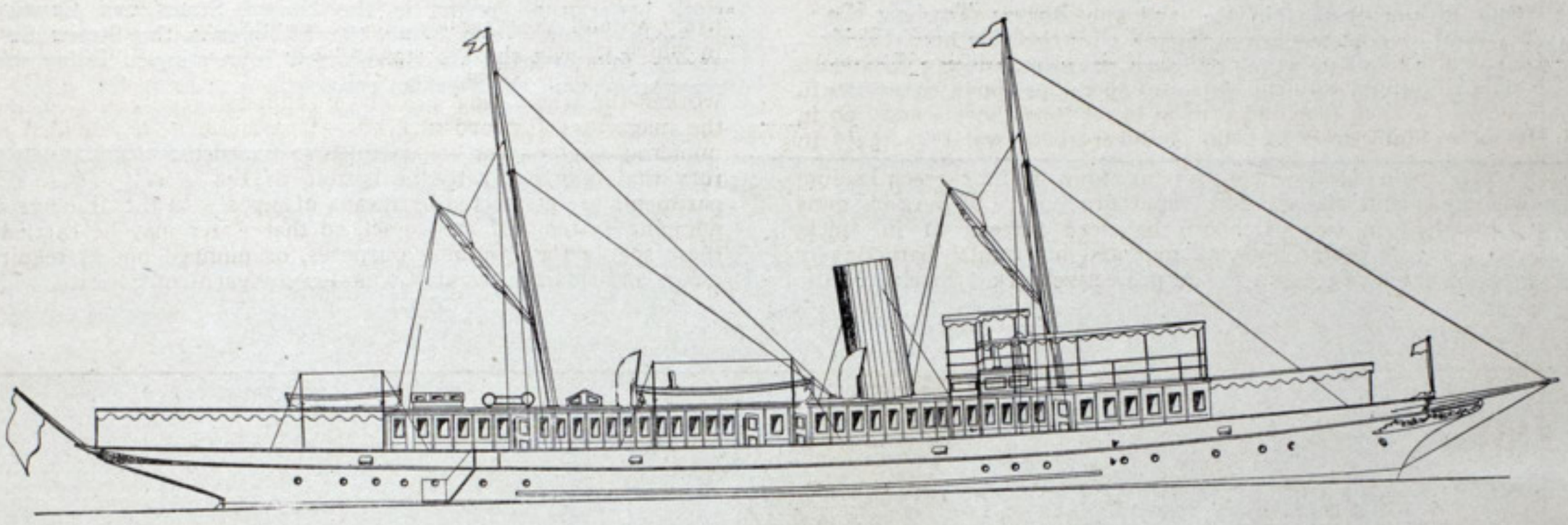
Work at the Crescent Ship Yard.

Elizabeth, N. J., Jan. 1.—Since the formation of the United States Ship Building Co. under the direction of Mr. Lewis Nixon, the Crescent Ship Yard and the Samuel L. Moore works are united as a part of the combination, with Mr. Mason Chase as president and Mr. Douglas Moore as vice president. Among the most notable vessels launched here during the past twelve months are an oil barge for the Pure Oil Co. of New York, the large twin-screw steam yacht Aztec, built for Mr. A. C. Burrage of Boston, the fish steamer Anstice for the Gulf Fisheries Co., and the Mexican gunboats Tampico and Vera Cruz. The United States monitor Florida and the 25-knot torpedo boats O'Brien and Nicholson are fast approaching completion. In each instance preliminary trials have already taken place and it is anticipated that all of these vessels will be delivered to the government in January next. Several other vessels are under construction and will be delivered to their owners early in spring, and with excellent prospects in the form of new contracts it is confidently anticipated that next year's record will prove as successful as any hitherto experienced.

The principal dimensions of the single-screw steam yacht Czarina, building to the order of Chas. F. Bryan of New York are as follows: Length over all, 166 ft. 3 in.; length on load line, 140 ft.; breadth, molded, 22 ft.; depth, molded, 11 ft. 6 in.; draught of water, 8 ft. 6 in.; displacement, nearly, 280 tons. The outboard profile of the Czarina, which the Review is enabled to reproduce through the courtesy of Mr. Chace, president of the local organization, proves the yacht to be of decidedly rakish and pleasing appearance. The long deck house and bold smoke-stack with the pole masts, clipper stem and long "Watsonian" stern, give at once the impression of symmetrical proportion and speed. The main engine is of the triple-expansion type, having cylinders of 14, 22 and 36 in. diameter with 24 in. stroke, supplied by steam from two Mosher water-tube boilers having a combined grate surface of 80 sq. ft. and capable of developing well over 1,000 I. H. P., with which, although the contract speed is but 15 knots, it is confidently anticipated will be easily exceeded. The coal bunkers extend fore and aft on both sides of engines and boilers, the latter separated by a large transverse bunker, the total coal capacity enabling the vessel to steam 3,000 miles at a speed of 9 knots. A Williamson steam steering engine, and steam capstan-windlass is also fitted and an elaborate ice making engine is installed for a large refrigerating chamber in the 'tween decks.

The long deck house is of mahogany and is fitted with metal storm shutters to the windows. In the fore end of this house is located a very handsome music saloon, adjoining which is the owner's private suite of rooms. At the extreme after end is located a large dining room with pantry and galley in close proximity. In the forward cabin deck the main saloon, extending across the full breadth of the vessel, is situated, together with three commodious double state rooms and toilet conveniences for the reception of guests. Aft of the machinery space accommodation is provided for all the officers and crew, the latter being placed at the extreme end of the 'tween deck.

In addition to the double bottom extending all fore-and-aft, the Czarina has six water-tight transverse bulkheads, and with

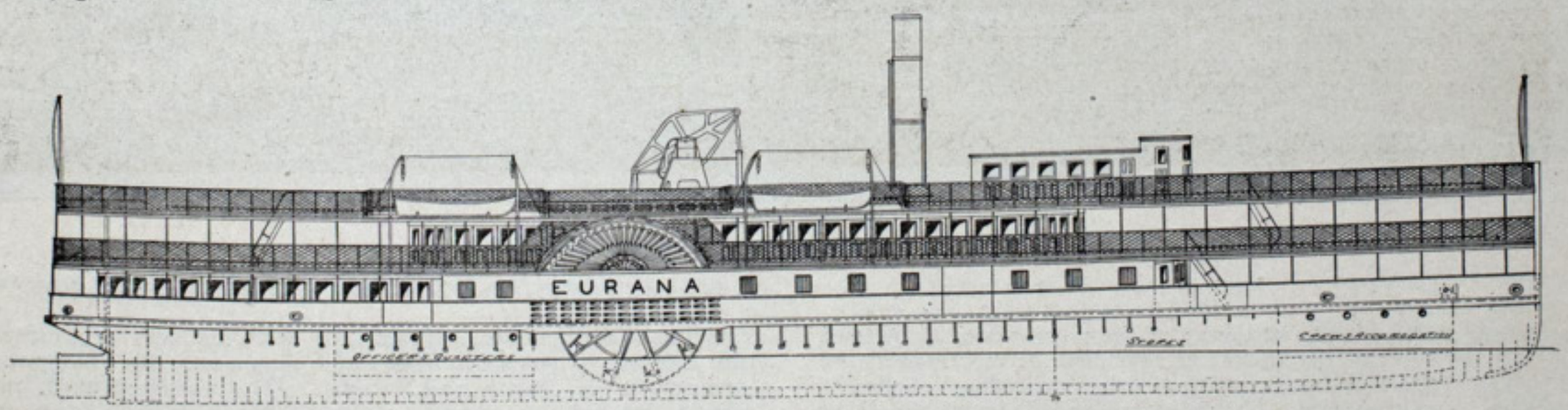


Steam Yacht Czarina for Mr. Charles F. Bryan, of New York.

[*Building at the Crescent Ship Yard, Elizabethport, N. J.*

web frames in the machinery space she is an exceptionally strong vessel. She is equipped with a life raft and four highly finished mahogany boats, one of which is a power launch. A complete electric light plant is another part of her equipment. When complete the Czarina will prove one of the handsomest as well as fastest yachts afloat.

The side-wheel steamer Eurana, building to the order of Chas. M. Schwab, Esq., is of special interest, illustrating as it does one of the most beautiful aspects of philanthropy yet attempted. Having purchased Richmond Beach, Staten Island, for the purpose of a park and recreation ground, Mr. Schwab desired the means for transporting daily during the summer months, a thousand of the poorest children of New York and Brooklyn, the Eurana being the outcome of that idea. The principal dimensions of this unique vessel are: Length over all, 211 ft.; length on water line, 201 ft.; breadth over guards, 54 ft. 7 in.; breadth, molded, 29 ft. 6 in.; depth to main deck, 11 ft. 6 in.; draught of water, 5ft. 6 in.; displacement, 480 tons.



The Side-wheel Steamer Eurana for Mr. Charles M. Schwab.

[*Building at the Crescent Ship Yard, Elizabethport, N. J.*

The vessel is of steel throughout the main structure of hull, decks and bulkheads, and is divided into seven transverse compartments to reduce danger arising from collision to a minimum. The accommodations throughout are of a most elaborate character and are designed purely to meet the ideas and conveniences of children, who may be carried to the number of at least a thousand. Rooms are provided for a doctor and a trained nurse, and for clercial work and managerial purposes. A cabin on the main deck aft provides sleeping accommodation for thirty children, and adjoining this is a well-equipped children's hospital, with all surgical and medical requisites in case of accident.

A capacious cold storage chamber is arranged on the main deck for the purpose of storing ices, fruits, meat and vegetables for the little passengers afloat or ashore. The toilet accommodation is a special feature in the Eurana, the main idea being, to impress upon the minds of children the value of sanitation and cleanliness. Drinking fountains of a novel character for iced water are to be fitted, and everything that can add to the comfort and instruction of children is being introduced. The machinery casings are to be fitted with glass panels throughout to allow children to watch the working of the machinery in motion. The children's upper cabin is tastefully furnished in old ivory panelling with mahogany seatings specially designed for little ones. The floors are covered with interlocking rubber tiling of a neat pattern. A special saloon has been built on the sun deck for the accommodation of distinguished guests interesting themselves in the welfare of poor children. The machinery is of the walking-beam type and is being built by Messrs. W. & A. Fletcher, Hoboken, N. J.

BOSTON STEAMSHIP COMPANY'S FLEET.

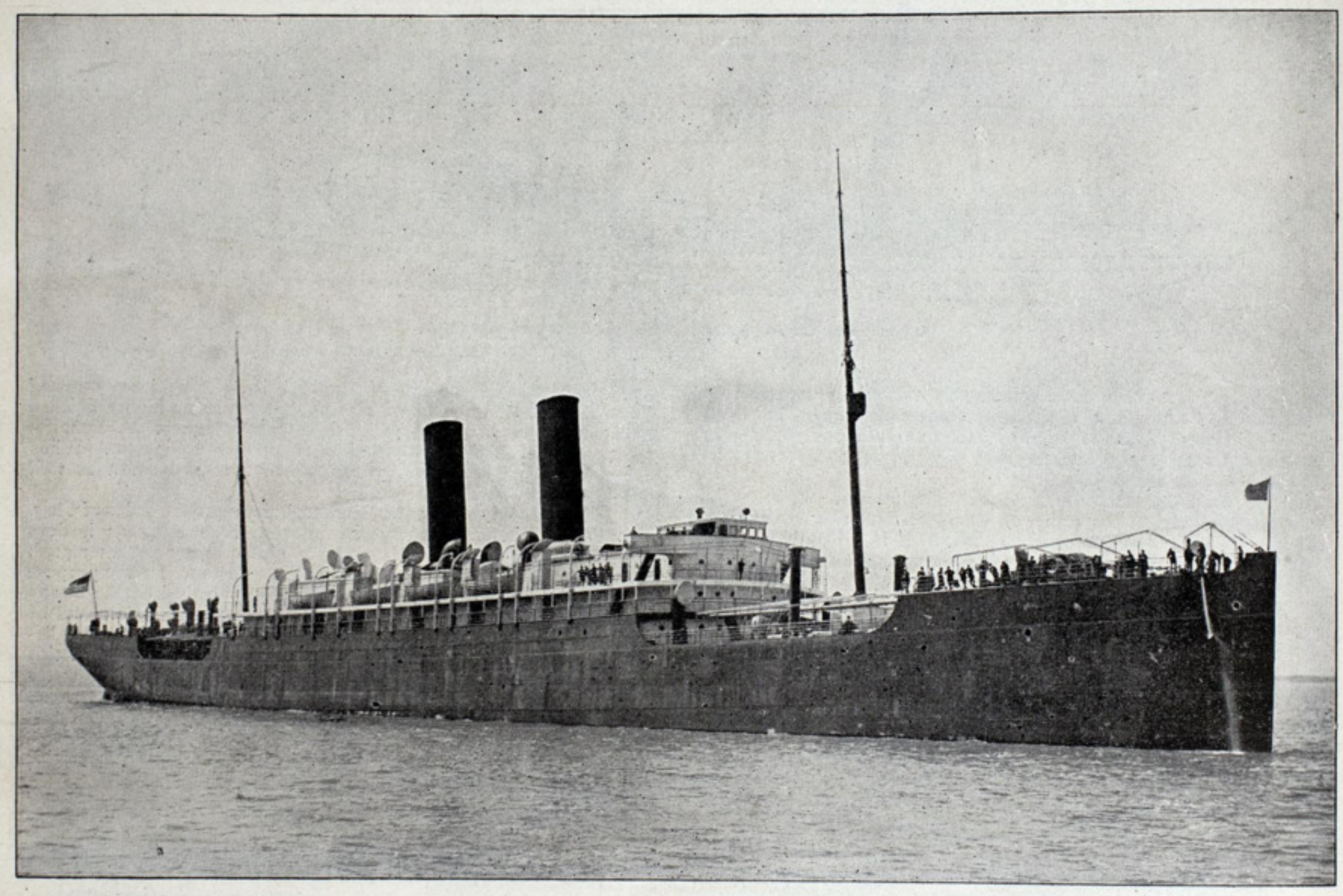
The Boston Steamship Co. and the Boston Towboat Co. have recently completed arrangements with the Northern Pacific Railway Co. to operate a line of cargo steamers between Tacoma and Seattle and all the principal ports in the orient in connection with that railway. The steamers of these companies to be used in this service are the Shawmut, Tremont, Lyra, Hyades and Pleiades. These vessels, carrying the American flag, are all fine modern cargo steamers. The Shawmut and Tremont are sister ships of 9,606 tons register, which have just been completed by the Maryland Steel Co. at Sparrow's Point, Maryland. They are 506 ft. long, 58 ft. beam, with a depth of 40 ft.; they carry 11,200 tons of 2,240 lbs., or 18,063 tons of 40 cu. ft. of cargo each. They are provided with triple-expansion engines and are able to maintain a speed of 15 knots an hour. They are especially built for the transpacific trade and are fitted with the most modern appliances for handling cargo with safety and dispatch. These two vessels are the largest cargo steamers which have yet been employed in the transpacific trade.

The steamships Hyades and Pleiades are also sister ships built by the Maryland Steel Co. in 1900 for the Boston Towboat Co. They are steel steamships of the following dimensions: Length, 331 ft. 5 in.; beam, 47 ft.; depth, 28 ft.; gross tonnage, 3,743; net tonnage, 2,932; deadweight capacity, 5,350 tons of 2,240 lbs.; loaded draught, 23 ft.; measurement cargo capacity, 6,740 tons of 40 cu. ft.; speed, 10½ knots. They have three decks, bridge, main and 'tween decks. Both of these ships are well-decked, the Shawmut, Tremont and Lyra being flush-decked.

The Lyra was built by the same builders at Sparrow's Point, Md., in 1901. She is a steel steamship of the following dimensions: Length, 331 ft.; beam, 47 ft.; depth, 35 ft. 7 in. She has triple-expansion engines, is fitted with all modern conveniences, and carries 6,000 tons deadweight, or 7,950 tons of 50 cu. ft.

The steamships Hyades and Pleiades will be operated in connection with the Northern Pacific railway in a regular and direct line from Seattle and Tacoma to Vladivostock, Port Arthur, Shanghai and Hong Kong, calling at other ports in North China when sufficient inducements are offered, returning by way of Japan, stopping at Moji, Kobe and Yokohama.

The steamships Shawmut, Tremont and Lyra will be operated in connection with the Northern Pacific railway, calling either way at Yokohama, Kobe and Moji. These steamships will run in a joint schedule in connection with the steamships Victoria, Tacoma and Olympia, owned and operated by the Northern Pacific Steamship Co., and will constitute the transpacific steamship service of the Northern Pacific Railway Co., giving a through service between all points in the United States and Canada, and Japan, China, Hong Kong, the Philippines, the Straits Settlements, Java and Eastern Siberia, and connecting at Dalny and Vladivostock with the Siberian railway.



A Type of the Year—The Pacific Mail Liner Korea.

[Built by the Newport News Ship Building & Dry Dock Co., Newport News, Va.

The company has just obtained from the war department the contract to transport troops and supplies to the Philippines and return, via Seattle and Tacoma. The war department reserves the right to regulate otherwise the supplies shipped to the Philippines from San Francisco.

The Baltimore Marine Railway Machine & Boiler Works is building a steam yacht for Mr. W. B. Hurst. The yacht will be 125 ft. long, 18 ft. beam and 7 ft. 6 in. deep. She will be equipped with triple-expansion engines having cylinders of 10, 15 and 24 in. diameter with stroke of 15 in. Steam will be supplied by two Almy water-tube boilers. The interior decorations are to be in mahogany. The yacht will also have an 18-ft. launch, a 16-ft. gig and a 14-ft. dingy. The yacht is now ready for calking and will be launched about Mar. 1, 1903.

The house committee on naval affairs has practically agreed to make no provision for the building of additional battleships in the naval appropriation bill, now in course of preparation. The secretary of the navy in his estimate asked for an appropriation for two new battleships but his request will be ignored.

Activity at Newport News.

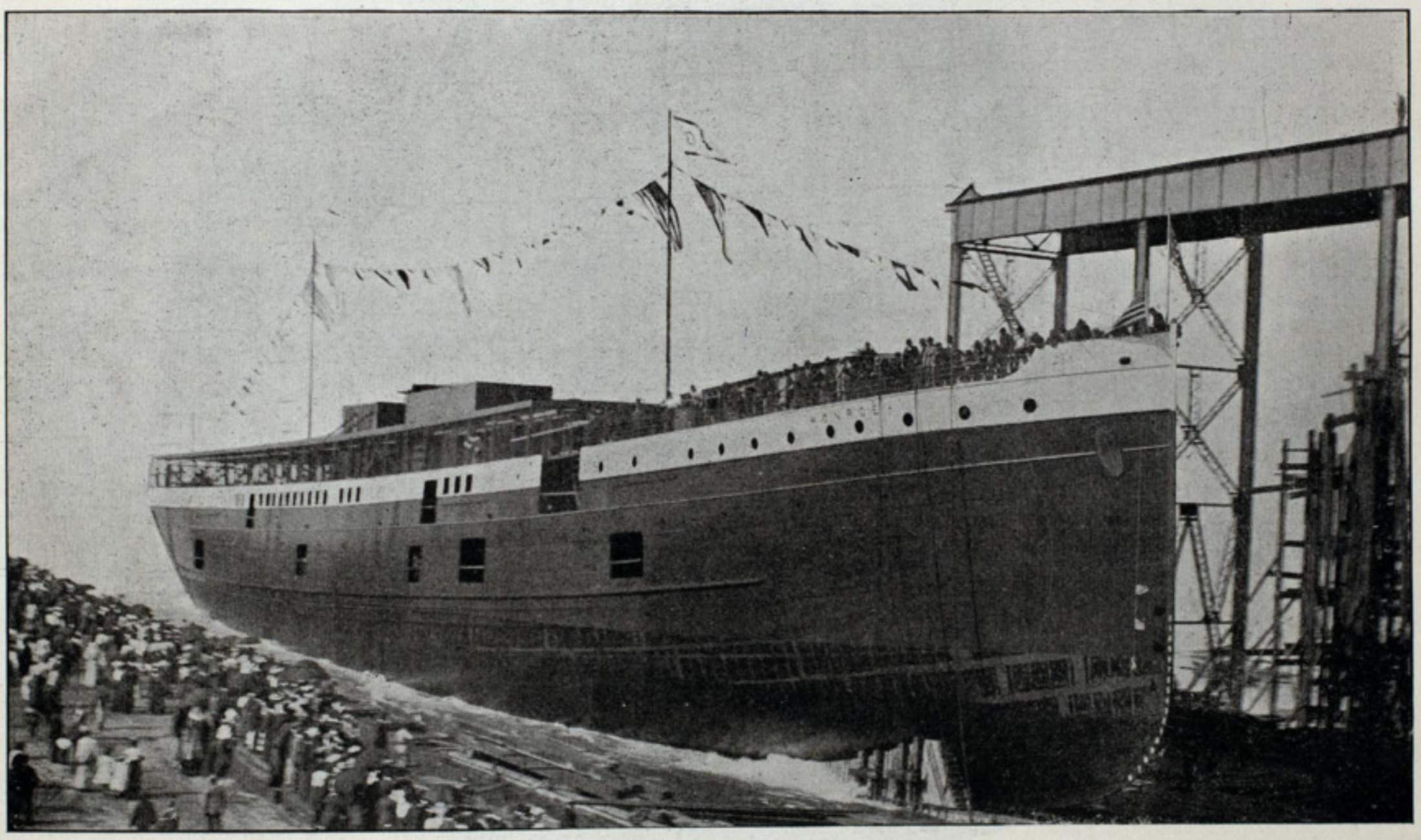
Newport News, Va., Dec. 31.—The Newport News Ship Building & Dry Dock Co. has just closed an unusually busy year and enters upon another with even brighter prospects, for six vessels are scheduled to be launched in 1903—four warships for the United States government and two steamships for the merchant marine. At this time the aggregate contract cost of the ships under way is about $25,000,000, and there is some probability that this will be increased in January by a contract for one of the two new armored cruisers to be awarded by the navy department. The record of the year was noteworthy particularly because of the completion of the two large Pacific mail passenger and freight steamers, each of 18,600 tons displacement and the largest vessels constructed in America up to their time, and because of the beginning of work on no less than five new warships and three new merchant vessels. In addition to the large number of ordinary repair contracts received there were three of important proportions. The general office building was enlarged to almost double its former size, extensions were made to the joiner and machine shops, a new galvanizing plant was built and work was started on a new mold loft and ship shed. Considerable new equipment was added, tools of the latest designs constantly being purchased as needed.

The only launching of the year was on Oct. 18, when the large passenger and freight steamship Monroe, building for the Old Dominion Steamship Co. was put overboard. This ship will be the queen of the Old Dominion fleet between New York and Virginia ports and will cost, when completed, in the neighborhood of $700,000. Keels were laid for the large armored cruisers West Virginia and Maryland, the battleship Virginia, the protected cruiser Charleston, the Saginaw Steel Steamship Co.'s large oil tank steamer and the Pacific coast lumber steamer Francis H. Leggett, besides the Old Dominion liner Monroe.

The battleship Missouri is now about 83 per cent. advanced towards completion; the armored cruiser West Virginia, 44 per cent.; the armored cruiser Maryland, 42 per cent.; the protected cruiser Charleston, 23 per cent.; the battleship Virginia, 14 per cent. The battleship Louisiana, which the yard is building in competition with the Brooklyn navy yard, which has the battleship Connecticut, a sister, under construction, is under way and the keel will be laid some time in February. The ships which will be launched in 1903 are the Virginia, Maryland, West Virginia, Charleston, Saginaw company's oil ship, which has not been named, and the Leggett. The Leggett will go overboard about the middle of January and the two armored cruisers will be launched in May, probably. Whether or not both vessels will be sent into the water the same day has not been determined. The Missouri will be given her builder's trial in May or June and should go into commission the latter part of the year. The Old Dominion liner will go in commission about March. The Leggett will be finished during the year and the oil steamship will probably be completed by next January.

The monitor Arkansas, built for the government, was placed in commission several months ago. This was the first of four ships of similar design to be completed. The most important repair contract of the past year was for the overhauling of the German cruiser Vineta, which is now the flagship of the German South Atlantic squadron, flying the flag of Commodore Scheder, and has been prominently mentioned in connection with the international complications in Venezuela. This was the second visit of the Vineta, the first contract being for minor attention and the second for a complete overhauling. Instead of sending its ships in American waters back to a home port to be repaired, the German government wisely concluded that it would be far more advantageous to send them to Newport News, saving considerable time and expense. The Vineta was here for some months and went away virtually a new ship inside. So well satisfied was the German government with the work and with its experiment that it is understood other warships on the South Atlantic station will be sent here for overhauling as soon as the Venezuelan trouble is settled. The Vineta was the first warship to be docked at a private ship yard in America and the first foreign warship to be sent to this country for repairs. Other repair contracts worthy of mention were for the overhauling of the Morgan liner El Mar and the conversion of the steamers S. V. and Harry Luckenbach from cargo vessels into oil carriers. The El Mar, which received a new boiler plant, has gone. The S. V. Luckenbach will get away early in January and the Harry Luckenbach will follow shortly after.

The general office building was formerly 200 ft. in length and was extended 150 ft. It has a width of 40 ft. In it are located all of the offices of the ship yard officials, government representatives and draftsmen for both ship yard and navy department. The enlarged building is completely occupied. The machine shop was extended 60 ft., its dimensions now being 560 ft. long and 100 ft. in width. The joiner shop was extended 60 ft. also, being brought out to a line with the machine shop extension. Its dimensions now are 360 ft. length and 60 ft. width. The new brick galvanizing plant is 103 ft. in length and 33 ft. in width. The new frame shed and mold loft, for which the foundation has been laid, will measure 400 ft. in length by 70 ft. in width. The work on this has been delayed somewhat by difficulty in getting iron material.



Launch of the Old Dominion Line Steamship Monroe.

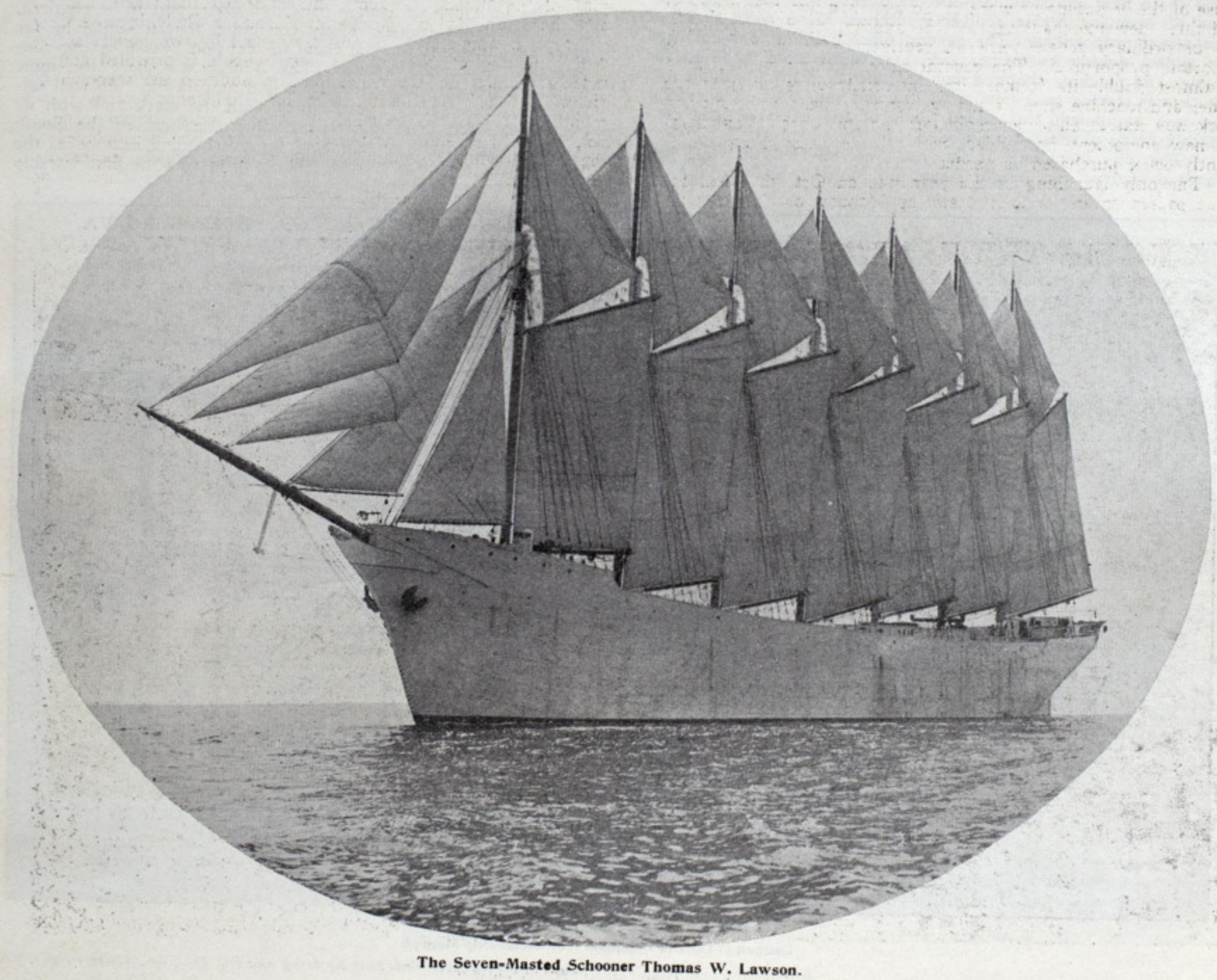
[Built by the Newport News Ship Building and Dry Dock Co., Newport News, Va.

Fore River Ship & Engine Co., Quincy, Mass.

During the past few weeks the Fore River Ship & Engine Co., Quincy, Mass., has secured some magnificent contracts. These include a new six-masted steel schooner for a syndicate headed by Capt. John G. Crowley and two steamers for the Fall River Line's Long Island sound traffic. One of these boats is for passenger service and will cost about $1,000,000 to build; the other is a $450,000 freighter. The lines and arrangements of the passenger steamer are patterned, in a general way, after those of the Puritan of the present fleet, while the freighter is to resemble the City of Taunton to a similar degree.

The new passenger steamer will be a side-wheeler with paddle-boxes built into the superstructure. She will be 397 ft. long over all, 378 ft. 6 in. long on the water line, with 50 ft. molded beam and 21 ft. molded depth, and will measure 88 ft. in breadth over the guards, at the widest part. She will have a double hull to the water line, racket-plated on the longitudinal system, and divided by watertight bulkheads into thirteen compartments. Above the double bottom, which is 3 ft. deep at the center, the hull will be divided into seven watertight compartments, with a collision bulkhead, and with a watertight collision steel deck 11 ft. below the main deck, running from the stem aft to the third compartment. The two inclined, compound engines of 5,500 H. P. and the Scotch boilers are to be set in steel enclosures rising above the main deck, and covered with a steel deck. There will be steam steering gear operated from an insulated pilot house. The electric lighting plant will consist of three General Electric 50-kilowatt vertical marine sets, with tandem compound engines, to be arranged for both condensing and non-condensing operation. They will be connected up in multiple arc, so that they may be run singly or in a group, and must develop 200-candle power for each mechanical horse power The current will be distributed by the two-wire system with special insulation and will light 1,600 16-candle power lamps. Besides a fire extinguishing service with thirty hose connections in different parts of the vessel, immediately controlled from the main engine room, there will be powerful steam fire pumps and additional hand fire pumps, with the usual equipment of chemical apparatus, etc. A Lyle life gun, such as is employed in the United States life saving service for throwing lines, twelve 26-ft. metallic life boats, ten 20-ft. rafts and 1,400 cork life jackets are provided further to insure the safety of the 1,200 passengers the steamer is built to accommodate.

The interior finish of the steamer will be particularly elaborate, the wood work being pine, decorated with carving, particolor frescoes, and heavy gilding. The most modern system of plumbing, supplied with pressure water service by a special pump will be introduced, and the steam heating apparatus will be sufficient to maintain a temperature of 65° throughout the vessel in the coldest weather.



The Seven-Masted Schooner Thomas W. Lawson.

[Built by the Fore River Ship & Engine Co., Quincy, Mass.

Dimensions of the freighter, which is to be a twin-screw steamer, are: Length over all, 318 ft.; length on water line, 291 ft. 3 in.; molded beam, 60 ft. 6 in.; molded depth, 22 ft. 6 in. She will have two vertical triple-expansion engines giving 4,500 H. P. and will be equipped with steam steering gear, an electric lighting plant and double freight elevators for forward and after hatches. The entire construction and fitting upon both vessels—except for upholstery, furniture, etc.—will be done at the Fore River yard. This is rather a departure for the Fall River liners, which have previously been built under separate contracts for hulls, engines and joiner work. This and the other work taken on in the last month will necessitate a very considerable increase of the Fore River's force of workmen in almost every department.

The keel was laid last week for a six-masted steel schooner, to be called the William L. Douglas, after the Brockton shoe manufacturer, who is one of the largest shareholders in the syndicate that will own her. The Douglas will be the first six-masted schooner built of steel and will be considerably larger than any wooden craft of the same type. She will be second in size, among American merchant "sailers," only to the seven-master Thomas W. Lawson, which was launched at Fore River

last summer for Capt. Crowley, and will represent the most advanced development of the sailing vessel and the most modern methods of steel ship building.

Her hull and interior construction will be such as would be given a transatlantic liner, her skin, as mariners call the outside of a ship, being joggle-plated—that is to say, made of steel plates the edges of which are bent to overlap one another so that the joints shall be absolutely watertight. Her masts will be steel cylinders tipped with Oregon pine spars and will reach 130 ft. above her deck. Steam will be used on the Douglas for almost everything except propulsion. She will have steam steering gear and pumps, and four engines, set on the open deck, will hoist and lower her sails—in which there will be more than 35,000 sq. ft. of canvas—and manage her anchors.

The engines will be so placed that they can also serve the huge hatchways in loading and discharging cargo. The whole vessel will be lighted by a dynamo, the steam for all the power being supplied by a boiler set in a deck house amidships. As on the Lawson, this use of machinery will be a great economy, reducing the number of men necessary to a crew of fourteen, including master, mates and engineer, while the first six-master, the George W. Wells, built for Capt. Crowley less than two years ago, requires twenty-four men, and the second, the only other six-master now afloat, carries twenty-nine men.

These features of the construction and equipment of the W. L. Douglas are not very different from those of the seven-master, but there the similarity ends, for the lines of the new schooner are quite distinctive. They were drawn by Bowdoin B. Crowinshield, the Boston marine architect who designed the Lawson and the yacht Independence, and are intended to give her great cargo capacity and at the same time good speed. As a coal-carrier she will outstrip the two six-masters now in commission, for she will be able to carry 5,700 tons. The Douglas will have two decks above her hold, with a deep tank for carrying water ballast—instead of a double bottom like that put into the Lawson—reaching from the keel to the second deck. Her general dimensions are: Length over all, 339 ft. 6 in.; length on load water line, 306 ft.; beam, 48 ft.; depth, 29 ft. 9 in.; load draught, 24 ft.; load displacement, 77,000 tons. She will be launched next summer.

The United States government has contracted with the Fore River company for the largest guns of modern type ever made in New England. They are 6-in., 50-caliber guns of the latest rapid-fire model for use on warships. Within a week after this contract was signed another was placed with the same company for a lot of 3-in., 50-caliber guns, which are also for naval use. Ten sets of the 6-in. guns are called for. They are of the most approved pattern for the main batteries of battleships and cruisers. Sixty sets of the smaller pieces, which are used in the secondary batteries of the larger vessels of the navy, will be made. The guns will be forged, oil tempered and annealed, bored, and turned at Fore River and then sent to the shops at the Washington navy yard to be finished.

Rapid progress has been made on the cruiser Des Moines since she was launched in September. Her pumps and other auxiliary machinery are now being put in and her decks are being laid. The propelling engines have been tested in the machine shop and are ready to take down and put into the vessel's hull as soon as the work on the engine room is sufficiently completed. The traveling gantry crane which is to serve the fitting-out dock at which the Des Moines is moored, and which will be used for installing the heavier part of the vessel's equipment, is all set up except for the jib, which is ready for hoisting into position at any time.

The two steel car floats building for the New York, New Haven & Hartford Railroad have been put overboard.

The stem casting of the twin battleships New Jersey and Rhode Island were hoisted into place recently and the plating of the fore part of the vessels' hulls will be begun soon. The 'midship section of the hull and decks as far up as the protective deck, and well forward and aft, is already nine-tenths finished on both vessels, which show about the same degree of completion. The decks of tne battleships are double-plated, red lead and cheese cloth being used to secure perfect contact between the metal sheets, which are fastened together with inch rivets. The first of the heavy armor that will cover the exposed parts of the vessels has arrived at Fore River.

SEVEN-MASTED SCHOONER THOMAS W. LAWSON.

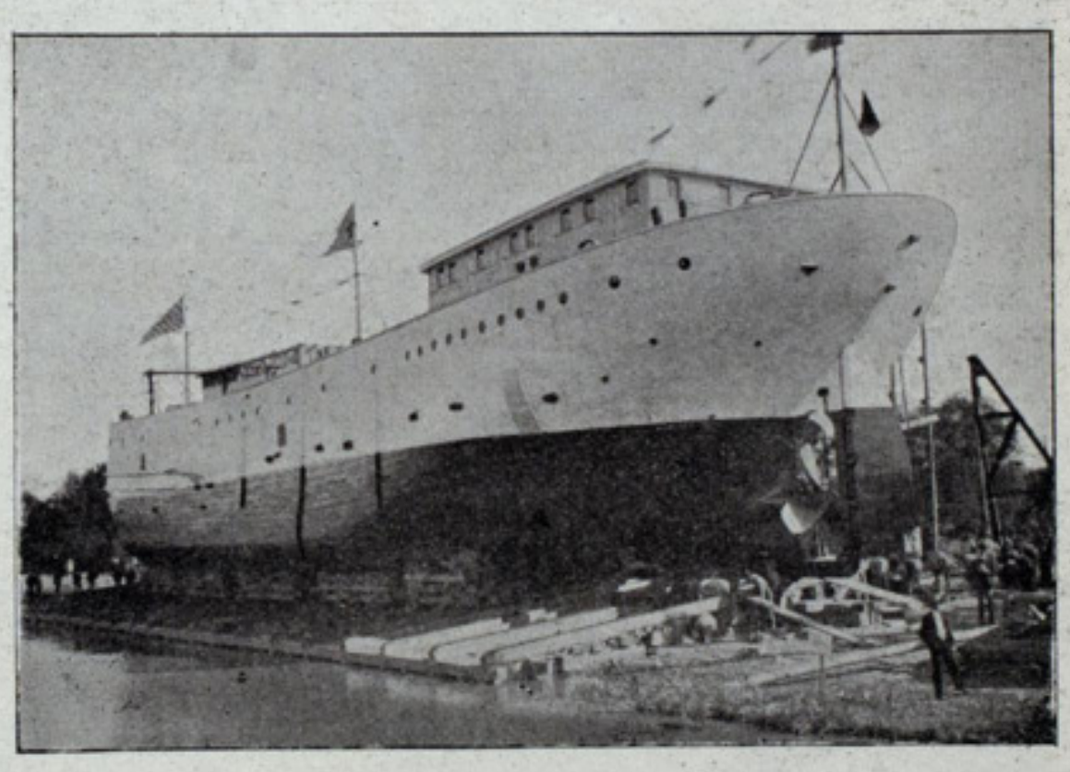
One of the novelties of the year was the construction of a seven-masted steel schooner by the Fore River Ship & Engine Co., Quincy, Mass. This is the first seven-masted schooner to be constructed anywhere in the world and it is understood that it has proved commercially successful. The vessel was christened Thomas W. Lawson in honor of the famous Bostonian. The Lawson measures 403 ft. over all, 368 ft. on the water line, has a beam of 50 ft. 5 in. and a draught of 26½ ft. She has cargo capacity of about 8,100 tons, and her displacement, when fully loaded, is about 10,000 tons. Forty-three thousand square feet of canvas are stretched from her seven masts, 155 ft. high, the lower masts being steel cylinders 135 ft. long and 32 in. in diameter, weighing nearly 20 tons each. The top masts are of Oregon pine, 58 ft. long. The spike bowsprit is of steel, 85 ft. long, so that from the tip of her bowsprit to the tip of her aftermost boom she measures 478 ft. She has six engines, one forward of 40 H. P. to work the capstan and hoist her two 10,000-lb. stockless anchors, and five others of 25 H. P. each to handle the sails and do stevedore work at her six hatchways when she is in port. The Lawson has a double bottom of cellular construction, 4 ft. deep between the inner and outer plating, divided into four compartments capable of carrying 1,000 tons of water ballast. Besides this there is a trimming tank at each end. Over 2,000 tons of open-hearth steel were used in the construction of the hull, the plating of which is on the joggle system. She has two continuous steel decks, besides a lower deck composed of a tier of beams connected together with stringers and tie-plates. The ends of the hull are very strongly built and are connected to each other by stringers between decks running the whole length of the vessel.

The Lawson has a forecastle and poop deck, a cabin and two deck houses, besides a wheel house. The cabin joiner work is of oak, natural finish, of plain and neat design. The weather decks and deck houses are covered with deck plank. The vessel is steered by both hand and steam power. She has complete plumbing and drainage systems, so connected that each compartment can be pumped out separately, or as a whole, by steam; also by two hand pumps. Steam is supplied by two boilers set at either end of the schooner. A siren whistle is provided and the cabin is piped for steam heating. In addition the schooner has a complete electric lighting plant and a telephone system.

This great vessel is sailed by a crew of only sixteen men, under command of Capt. Arthur L. Crowley. She is employed in the coal carrying trade and has, indeed, been signally successful in it.

PETERSBURG IRON WORKS CO., PETERSBURG, VA.

The Petersburg Iron Works Co., Petersburg, Va., launched lately the United States sea-going dredge Gen. Abbott. This will be one of the largest and most powerful dredges owned by the government and will have a capacity of several thousand cubic yards per day. The length on the water line is 200 ft.; beam, 40 ft.; depth, 20 ft. It is self-propelling and is driven by fore-and-aft compound engines of 1,000 H. P., supplied by steam from two Scotch boilers. The dredge is handsomely furnished inside with cherry and other hard woods and has ample quarters and accommodations for a crew of forty. It will be fitted out in every detail by the Petersburg Iron Works Co., and will first be used for dredging the ship channel on the bar off Charleston, S. C. The cost complete will be $200,000. In addition to building this dredge the Petersburg Iron Works Co. has finished and fitted out lightship No. 74 and a dredging dump scow.



The United States Sea-Going Dredge, Geo. Abbott.

[Building by Petersburg Iron Works Co., Petersburg, Va.

WARRINGTON IRON WORKS.

Although established less than a year ago, the Warrington Iron Works, foot of West Wellington street, Chicago, has been so crowded as to be compelled to refuse considerable marine work. Included in its output is a 78-ft. wooden steam yacht with compound engine and Warrington water-tube boiler for H. E. Lytton of Chicago, as well as seven 24-ft., fin-keel, sailing yachts for members of the Chicago yacht club. In hand now is a 42-ft. passenger launch for Andrew Hansen, to be fitted with a Warrington gasoline engine of 20 H. P. and to be delivered in April next. The plant of this company is being built up while the regular work from customers goes on. Additions and extensions are being made all the time. Several large horizontal tubular boilers have been constructed for new buildings in Chicago and more work of this kind is in hand. The Kearns pop safety valve, handled at these works, is meeting with large sale.

Products and Progress at Cramps.

During the year the Cramps, Philadelphia, have been unusually active and have turned out what are unquestionably among the finest steamships ever constructed in the United States. These are the Kroonland and Finland, which have been added to the Red Star Line. A brief description of these vessels will be found in this article. The Cramps have at present under way an oil steamer, to be known as Col. E. L. Drake, for the Standard Oil Co., which will be 360 ft. long and will be equipped with triple-expansion engines and two Scotch boilers; a twin-screw steamer for the Central Railroad of New Jersey, to be 297 ft. 3 in. long and to be equipped with two sets of triple-expansion engines and Scotch boilers; a single-screw coastwise steamer for the Clyde Line, to be an exact duplicate of the steamship Huron, to be 300 ft. long and to be equipped with triple-expansion engines and two single-ended boilers of the return-tube cylindrical marine type. For the naval vessels which the Cramps are building for the United States government, their most important work, the reader is referred to the large table on the first page of this issue.

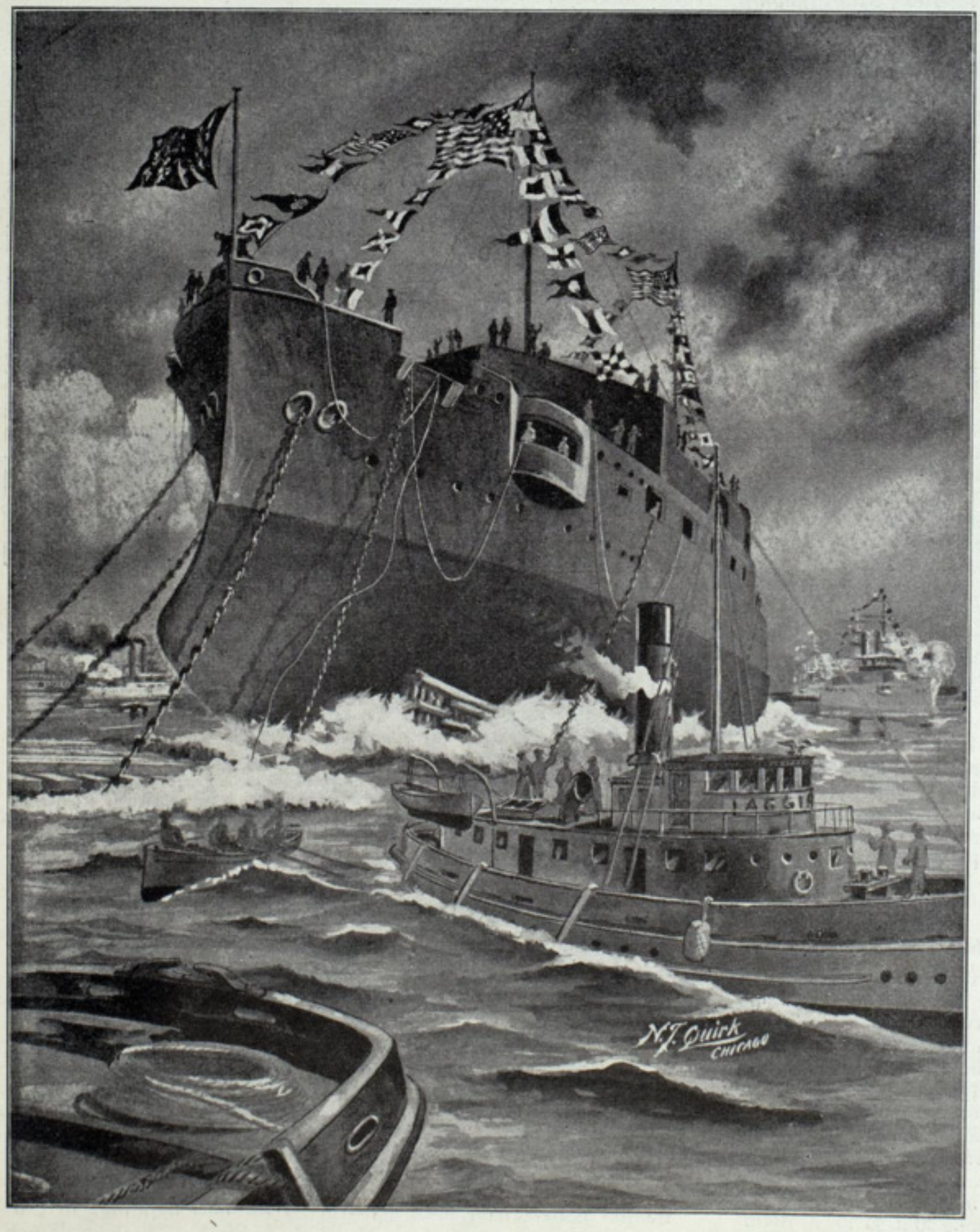
The company is also building a cruiser for the Turkish government, which is to be of about equal displacement to the Denver class of cruisers, now building for the United States navy. This new Turkish cruiser will have a length of 240 ft, on load water line, with a beam of 42 ft. and with 16 ft. draught. This will give her a displacement of 3,250 tons. The speed requirement is most severe and will make her the equal of the now famous Variag, except in size and armament. Under the contract she must develop a speed of 22 knots and this is to be secured by means of twin-screws and two triple-expansion engines of 12,000 I. H. P. Steam is to be generated in Niclausse water-tube boilers of the same pattern as those in the Russian ships Retvizan and Variag. In armament the vessel will have unusually heavy batteries for a cruiser of her class and size. The main battery consists of two 6-in. quick-fire guns, to be placed one forward and one aft on the middle line of the ship and protected by armored shields; eight 4 7/10-in. quick-fire guns, arranged in 'midship battery and similarly protected. The secondary battery consists of six 47-millimeter rapid-fire guns and six 1-pounder machine guns, all protected by shields. In addition, there are to be 175 magazine rifles for the crew. The entire ship will be lighted by electricity, and there will be four searchlights, two forward and two aft, located on the superstructure and on the military tops. All of the ammunition hoists are to be operated by electricity and each by a separate motor. The cruiser is to have two steel masts with military tops, with wooden spars for signaling. In internal fittings the details of construction used in the United States navy will be closely followed. This applies to ventilation and sanitation and includes space for quarters for officers and crew. The new cruiser will be fitted as a flagship and will accommodate twenty officers and 280 men. There is no time clause in the contract but the vessel is to be turned over to the Ottoman government complete and ready for use.

Cramps also have on hand a large amount of repair work, having but recently completed the lengthening of the Apache and Arapahoe of the Clyde Line.

But the chief work in the merchant line, as stated in the beginning, has been the construction of the Red Star liners, which are the equal of anything afloat. A description of one will answer for both. The Kroonland is a twin-screw steamer with a length between perpendiculars of 560 ft., breadth, 60 ft., depth, 42 ft. and gross tonnage of about 12,000. There are eleven watertight bulkheads, so arranged that flotation may be maintained with any two compartments full of water. Special attention has been given to the construction of these bulkheads, which are stiffened in accordance with the requirements of the bulkhead committee of the British board of trade. If the Kroonland should be needed for service in time of war the disposition of the bunkers would give coal protection to the boilers, while safety from breakdowns is practically assured by the adoption of twin-screws, which are fitted with enclosed shafting and brought close together by the adoption of a small aperture in the stern frame.

Below the main deck, the hold and 'tween decks of the vessel are devoted to the carriage of cargo and stores, with the exception of a space amidships comfortably fitted for the firemen. This portion contains a promenade and is fitted with sheltered seats—a wise and thoughtful provision for the firemen's comfort. There is also a space aft for the use of the stewards. There is cubic capacity sufficient for some 11,000 tons of cargo, and tanks are provided for more than 200 tons of fresh water, in addition to what may be condensed en route. The store rooms are spacious and well arranged for the large quantities of provisions that will be carried. They include refrigerated chambers for meat and other perishable articles.

The main deck is given up to passenger accommodations. At the forward end are three compartments for third-class passengers, the men's quarters, and at the after part of this deck are the compartments for the married third-class passengers, who are berthed in staterooms containing two, four or six berths. These quarters have well lighted dining rooms. Every compartment has a wide companionway leading to the houses on the upper deck, which contain the lavatory and sanitary accom-



Launching a Battleship at Cramps.

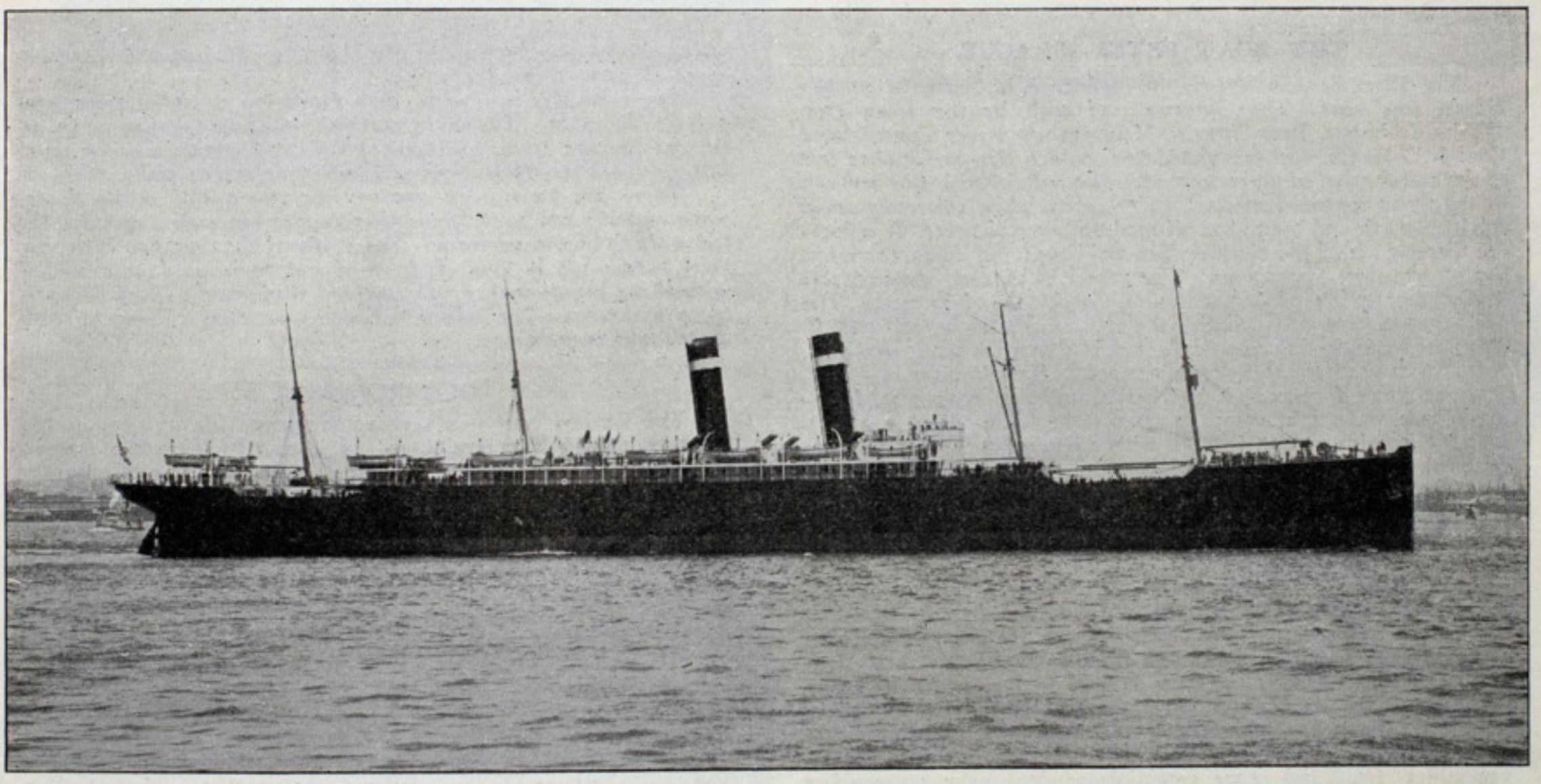
[*From a Drawing by Nicholas J. Quirk Chicago, Ill.*

modations, also giving access to the promenades on that deck. On the upper deck, amidships, are staterooms for 106 first-class passengers. On this deck is also the first-class dining saloon, situated between the funnels, and extending the whole breadth of the vessel. It can seat 208 passengers. The furniture is mahogany, except the sideboards, which are of satinwood inlaid with various woods. For lighting and ventilation, in addition to the large and numerous side lights, there is an unusually large trunk-well extending through two tiers of decks and tastefully decorated in white with a richly ornamented glass roof. The seats are covered with moquette and the upholstery throughout is in excellent keeping with the color scheme of the other decorative materials. Aft of this saloon, and between it and the second-class dining saloon, are situated the galleys, sculleries and pantries, so arranged that ready service can be given to either class of passengers and fitted with all the best and latest appliances. The second-class dining saloon comes next and also extends the full width of the ship. It can seat 120 passengers and is paneled with tapestry upon a soft cream white ground. The furniture is in mahogany and carpets, cushions and curtains are in varying shades of one color, giving a very pleasing effect. There are staterooms for seventy-six second-class passengers aft of this saloon.

Coming now to the upper deck and starting forward, there is a long forecastle fitted up for the accommodation of crew and petty officers, with hospitals and lavatories for steerage passengers. Amidships is a bridge house 220 ft. long with staterooms for 204 first-class passengers at the fore end and 120 second-class at the after end. These staterooms are large and excellently lighted and ventilated. In the deck house aft is the social room for third-class passengers. The deck above is the promenade deck, which is sheltered by the permanent deck formed by the boat deck. Herein are located the first-class library and smoking room, as well as suites and special cabins. These rooms are in deck houses, lighted by Mullen's patent rectangular windows, with ventilating stained glass panels in the upper part. The sanitary accommodation for all classes of passengers is well arranged and distributed rather than concentrated. There can be carried altogether 342 first-class, 194 second-class and about 1,000 third-class passengers. The navigation officers' cabins are placed above the promenade deck and at the fore end of the boat deck; and above their deck house is a spacious bridge, giving a clear view over the whole vessel and well sheltered by a strong steel bulwark.

There are altogether twenty boats, including four patent collapsible ones. The life boats are of steel and are carried in the usual manner under davits. Each is fitted with patent disengaging gear. The arrangements for loading and discharging cargo are very complete. There are nine hatches, each having its own winch and derrick, with the necessary fittings to insure rapid handling. The upper deck hatches are fitted with dished steel covers instead of the usual wooden ones.

The ship is lighted throughout by electricity, the installation of which was fitted by the builders. The generating plant is situated in a large room convenient of access from the engine room, and consists of four dynamos driven by engines of the Sturtevant company of Boston.



A Type of the Year—The Red Star Liner Kroonland.

Photo. copyrighted by the International Navigation Co. [*Built by Cramps, Philadelphia, Pa.*

WILLIAM R. TRIGG CO., RICHMOND, VA.

The ship yard of the William R. Trigg Co., Richmond, Va., has an abundance of work under way. While it is only a little over three years since the keel of the first vessel was laid, the yard has delivered to the government the destroyers Dale and Decatur and the torpedo boats Shubrick, Stockton and Thornton; to private firms the stern-wheel steamer Samuel N. Lapsley, now in commission on the Congo river, Africa; the Chesapeake & Ohio passenger steamer Virginia, holding the speed record for the Chesapeake bay; the Old Dominion steamer Berkeley for the James river service and the tug boat Lancaster, flag ship of the New York harbor service of the Pennsylvania railroad.

This company at present has the following vessels under construction: The cruiser Galveston for the United States navy, of the following dimensions: Length, 309 ft.; beam, 44 ft., depth, 31 ft.; 3,200 tons displacement, 4,500 H. P., 16½ knots guaranteed speed. This vessel will be launched during January. She has already received her boilers, and her engines are well under way. The revenue cutter Tuscarora was completed during the fall and will be in commission on the great lakes next season. The Tuscarora's trial was held in Hampton Roads and Chesapeake bay. The machinery was run at full speed for a period of six hours and the average revolutions of the engine for that time was 180. Owing to the prevailing coal strike it was impossible to get any but a very inferior grade of coal at Richmond with which to make the trial trip. In addition to that the vessel's bottom was very foul. Notwithstanding these drawbacks she attained a speed of 14.3 knots (3 knots in excess of the requirements) over a known distance between lighthouses. The machinery, although designed for only 1,200 H. P. with natural draft, developed an indicated horse power of 1,416. There was no heating of bearings and all parts of the machinery, including windlass, steering engine, etc., performed very well indeed under maximum tests.

Work is progressing rapidly upon the revenue cutter Mohawk for the Porto Rico station. She is at present receiving her machinery. Her dimensions are: Length, 206 ft.; breadth, 32 ft.; depth, 17 ft.; displacement, 850 tons; horse power, 2,100. The hull of the twin-screw suction dredge Benyaurd, designed for use in the southwest passage of the Mississippi river, is in frame and is being plated. Her dimensions are: Length, 272 ft.; beam, 48 ft.; depth, 23 ft.; displacement, 4,000 tons; horse power, 1,300; Work is well under way on the steamer Capt. A. F. Lucas for the Standard Oil Co. She is 375 ft. long, 50 ft. beam and 23 ft. deep. She will have a single screw. Her displacement is 9,000 tons, her horse power 2,000, and she is designed for a speed of 11 knots. The company is also building two tugs, Bristol and Chester, for the Pennsylvania Railroad Co. of the following dimensions: Length, 105 ft.; beam, 22 ft.; depth, 12 ft.; displacement, 250 tons. The keels of these tugs have been laid and the machinery is under construction. A sea-going tug is also under construction for service between Norfolk and Cape Charles. The tug will be known as the Cape Charles and will be of the following dimensions: Length, 122 ft.; beam, 24 ft.; depth, 12 ft. 7 in. Her engine will have cylinders of 20 and 40 in. by 28 in. stroke, supplied with steam from one Scotch boiler. Her keel has been laid.

The Peter Sprague—Largest Towboat in the World.

[Built by Iowa Iron Works, Dubuque, Iowa.

TOW BOAT PETER SPRAGUE.

The Peter Sprague enjoys the distinction of being the world's largest tow boat. The Sprague was built by the Iowa Iron Works, Dubuque, Iowa, for the Monongahela River Consolidated Coal & Coke Co. and completed her maiden trip in October last to the satisfaction of all concerned. She is finished inside and out in the most approved manner. Her cabin, while relatively small for her length and beam, has all modern conveniences. It is located directly aft of the clerk's office amidships and contains a number of excellent staterooms. The vessel is of such unusual size that a description of her will undoubtedly be of interest. The hull is 275 ft. long, and including the 40-ft. diameter wheel, 318 ft. long; width, including guards, 64 ft. 8 in.; depth at shallowest part, 7 ft., at bow 10 ft., and at stern, 12 ft. Her draught is 5¼ ft. She has three fore-and-aft bulkheads and nine crosswise, forming eleven watertight compartments. The boiler deck is 250 ft. long, 63 ft. wide and 15 ft. high with a bunker space of 85 ft. between the boiler room and engine room. This deck is supported on three rows of 6-in. hollow steel columns, 15 ft. apart, extending the full length of the deck, and angle bars at the sides about 2 ft. apart, all supporting heavy strings of the channel bars on which the deck beams rest.

The cabin is 170 ft. long by 38 ft. wide. There are eight staterooms for officers of the boat on each side of the 20-ft. cabin, finished up in modern style. Aft of these are separate sleeping compartments and mess rooms for deck hands and firemen. Bath and toilet rooms are for the crew as well as the officers—the only tow boat on the river which can claim such consideration for the workmen. Even the cabin boys have their own exclusive sleeping apartment. There are also cold storage rooms for meat, vegetables, fruit and other essentials to feed over seventy-five men for a round trip of from thirty to forty days from Pittsburg to New Orleans. In addition there is a large kitchen, bakery and laundry, furnished with all the conveniences of first-class packets, even though boats of this class are barred by government regulation from carrying passengers.

The total weight of the boat is 20,000 tons. She has four balance steel rudders 22 ft. long by 4 ft. deep, having a united water resistance of 352 sq. ft., weighing 20,000 lbs. each. The wheel is 40 ft. wide and 40 ft. in diameter. There are twenty-one buckets 4 ft. deep of 2 and 3-in. oak plank. The arms are of hickory, all giving a face measurement of 3,700 sq. ft.

The immense hollow, nickel steel shaft, the largest stern-wheel shaft in the world, was forged by the Bethlehem Steel Co., Bethlehem, Pa., and is made of their well known fluid-compressed Bethlehem nickel steel, thoroughly annealed, hollow ground on a mandrel under hydraulic pressure. Its dimensions are as follows: Length over all, 47 ft. 2 in.; outside diameter, 31 in.; diameter of hole, 21 in. along the center, reduced to 10 in. at the ends; shipping weight, 80,220 lbs., which, with the weight of timbers, pockets and other working parts, make the total weight of the wheel 160 tons. It is supported on monster beams, constructed of steel plate, and bars extending 43 ft. over the stern and 82 ft. inside on the hull deck, to which they are riveted. The pitmans are of Oregon fir 50 ft. long, 25 in. thick and 26 in. deep at the center, tapering to 16 in. at the ends.

The vessel has six sets of patented boilers. They are constructed of ¾-in. steel plate and suited to 200 lbs. pressure to the square inch. The boilers are 7 ft. in diameter and 14 ft. long. Inside of the small boiler shells is a corrugated plate, which forms the firewall of the furnace, leaving a 4-in. water space all around the fire within.

The chimneys are 50 ft. high from top to boiler flues, and 5 ft. in diameter. The pipes through which the steam is fed to the engines are 11 in. in diameter and 10 ft. long; six line pipes 6 in. in diameter, 10 ft. long and two 7-in. branch pipes.

There are twenty-six engines to utilize this steam force, some massive and some diminutive in size but each important for the work it has to perform. The work of the Sprague is to tow sixty barges 170 ft. long, 26 ft. wide and 10 ft. deep, each loaded with 28,000 bu. of coal or 1,680,000 bu. altogether, to New Orleans from Pittsburg. She has a complete electrical equipment with searchlight connections.

OLD IRONSIDES.

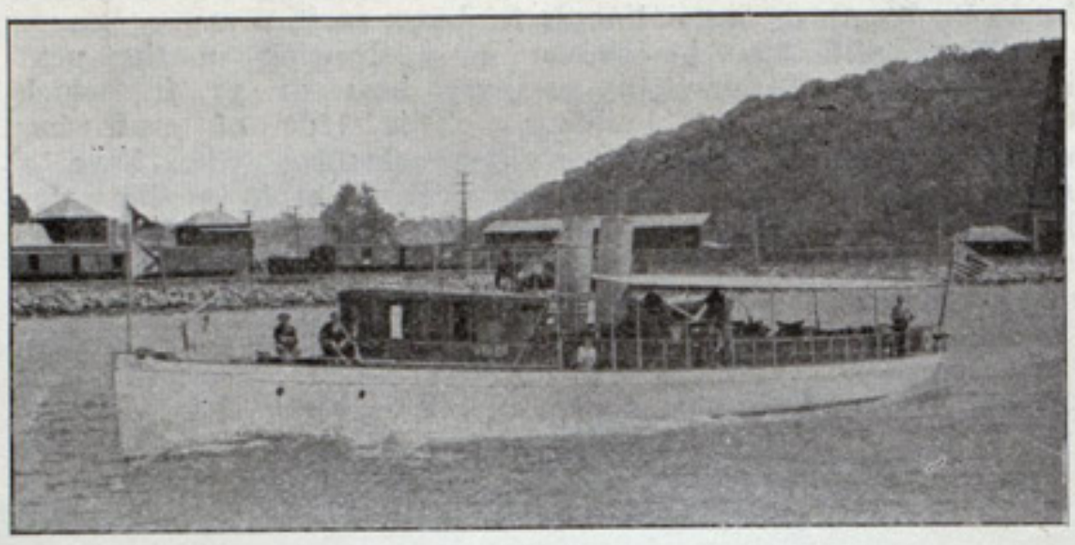
The Review uses this year as the cover for its annual ship building edition a reproduction of Marshall Johnson's famous painting "The Constitution," which is published as a photogravure by A. W. Elson & Co., No. 146 Oliver street, Boston, Mass., and properly protected by copyright. It is through the courtesy of A. W. Elson & Co. that the Review prints this famous picture. The Constitution was one of the first three vessels with which the American navy enforced its claim to recognition on the sea. Built and launched at Boston in 1797, she began a career that rapidly made her name a household word and brought to the new republic the respect of much stronger nations. "Old Ironsides" took a prominent part in the hostilities with France, which opened the year following her launching, and in the Tripolitan and Algerian wars between 1802 and 1805. It was in the war of 1812, however, that she won her greatest distinction. The American people had entered the conflict with but little heart and needed the encouragement of some signal success. It was when the outlook was most gloomy that the news of the Constitution's almost miraculous deliverance from an English fleet aroused the greatest enthusiasm. Returning from European waters she fell in with a squadron of seven vessels led by the Africa, a razee of sixty-four guns. Hull, who was in command and ever ready for a daring stroke, immediately maneuvered to cut out one of the vessels, but as there was little wind, gave it up and stood away to the east. The hostile fleet took up the pursuit. For three days there was no wind but the Constitution managed to keep just out of gunshot. Upon the Constitution large umbrella-like contrivances were made and fastened to cables and then carried in small boats a long ways ahead. When pulled in by men on the warship they opened, catching the water and enabling the vessel to make some progress. Then there came a breeze that filled the Constitution's sails and carried her to safety. A month later occurred her famous fight with the Guerriere, which in half an hour was reduced to a hopeless wreck. Later she captured the Java, Cyane and Levant. At the close of the war she went into ordinary and the government contemplated breaking her up and probably would have done so had not Oliver Wendell Holmes shamed it with the poem "Old Ironsides."

The newly organized Norwalk Steamboat Co., Norwalk, Conn., has voted to build a new steamer at a cost of $55,000. It will be a combination freight and passenger steamer. The dimensions will be: Length over all, 180 ft.; keel, 172 ft.; beam, 32 ft.; draught, 6½ ft. The contract has not as yet been let.

Busy in Yacht Construction.

The Gas Engine & Power Co. and Charles L. Seabury & Co., Consolidated, of Morris Heights, N. Y., have put in an unusually busy year and are at present crowded with work. There is a lively demand for naphtha launches which are an especial feature of these works and which have won applause wherever they have been sent. These launches utilize the expansive power of naphtha and not the explosive force of gasoline and are particularly desired on that account. The yard is also crowded with orders for yachts. Two of the products of the year just closed, the Vixen for Mr. John D. Archbold and the Helenita for Mr. Frank J. Gould of New York, have achieved distinction as speedy craft.

Among work at present under way is the steel steam yacht Aria for Mr. E. H. Blake of Bangor, Me. The dimensions of the Aria are: Length over all, 165 ft. 4 in.; length on water line, 138 ft.; beam, molded, 18 ft.; depth, molded, 11 ft. 3 in.; draught, 8 ft. The Aria is designed for a high speed cruiser and will be used on the Maine coast. As noted, she is of steel



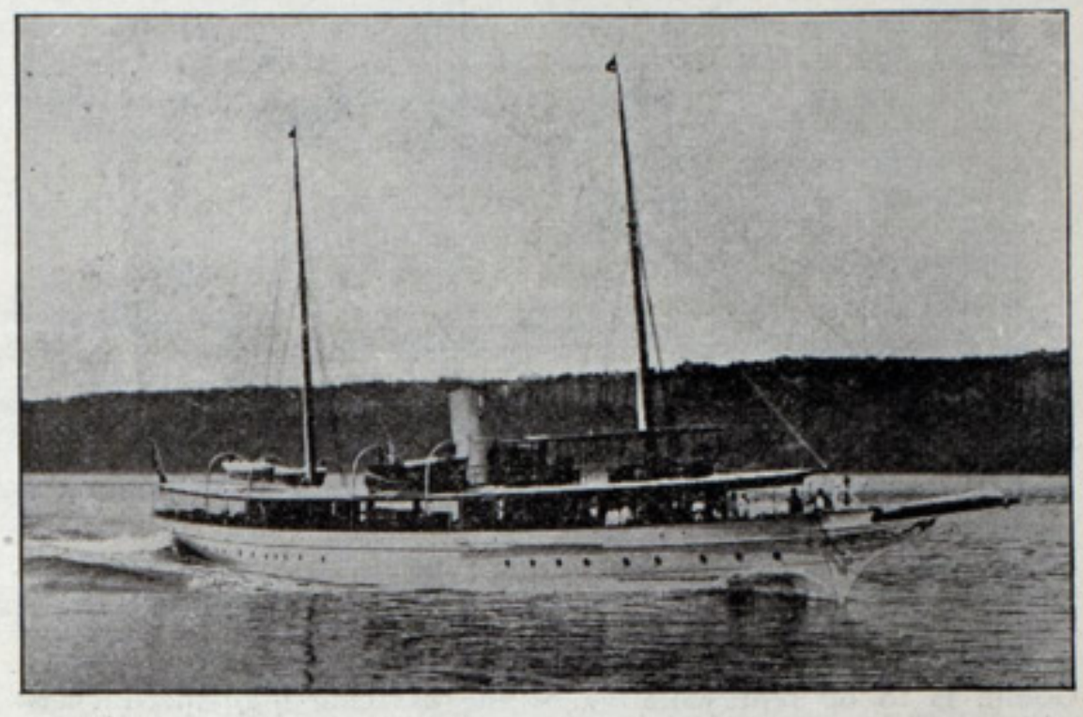
The Vixen, owned by John D. Archbold, of New York.

construction with bulwark. She will have one deck house finished in mahogany inside and outside, the interior being appropriated for a dining saloon, butlers' pantry, smoking room and drying room. The top of the deck house will be fitted with brass railing and awning for purposes of observation. The yacht will be steered from the bridge. The owner will have a large quarter deck, and the space below will be devoted to two double staterooms for the owner and his family with a toilet and bath adjoining each and taking the full beam of the vessel. There will be one single and one double stateroom and a bath room

A 21-ft. Yacht Tender.

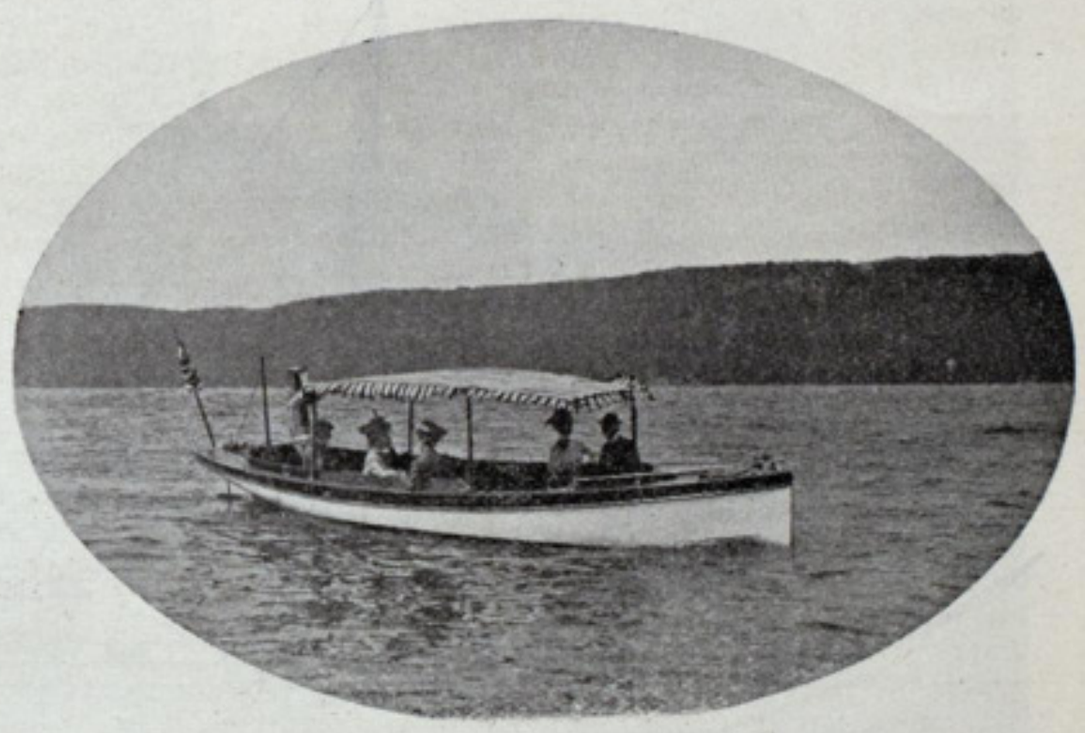
aft for guests and between these two sets of staterooms there will be a large saloon with divan seats and companionway from deck. The finish of the owner's staterooms will be in white mahogany and the other compartments will be in red mahogany.

The machinery will consist of a triple-expansiou engine with cylinders of 12, 19½ and 32 in. diameter with stroke of 18 in. Steam will be supplied by a Seabury water-tube boiler, firing from each end and having a passage entirely around it. There will be a thwart coal bunker at each end of boiler. A complete electric lighting plant will be installed with search-



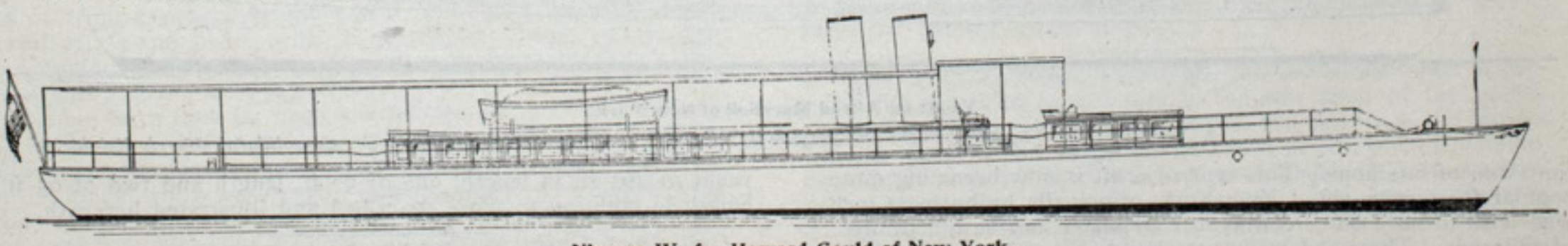
The Helenita owned by Mr. Frank J. Gould.

light connected. Forward of the machinery compartment will be a galley, fitted with all the requisites for preparing an elaborate dinner. The dining room will be directly above this galley and will be served by dumb waiter. The captain, engineer, steward and mate will each have an individual stateroom, and the forecastle will accommodate twelve men. The yacht is designed for a speed of 18 miles per hour.



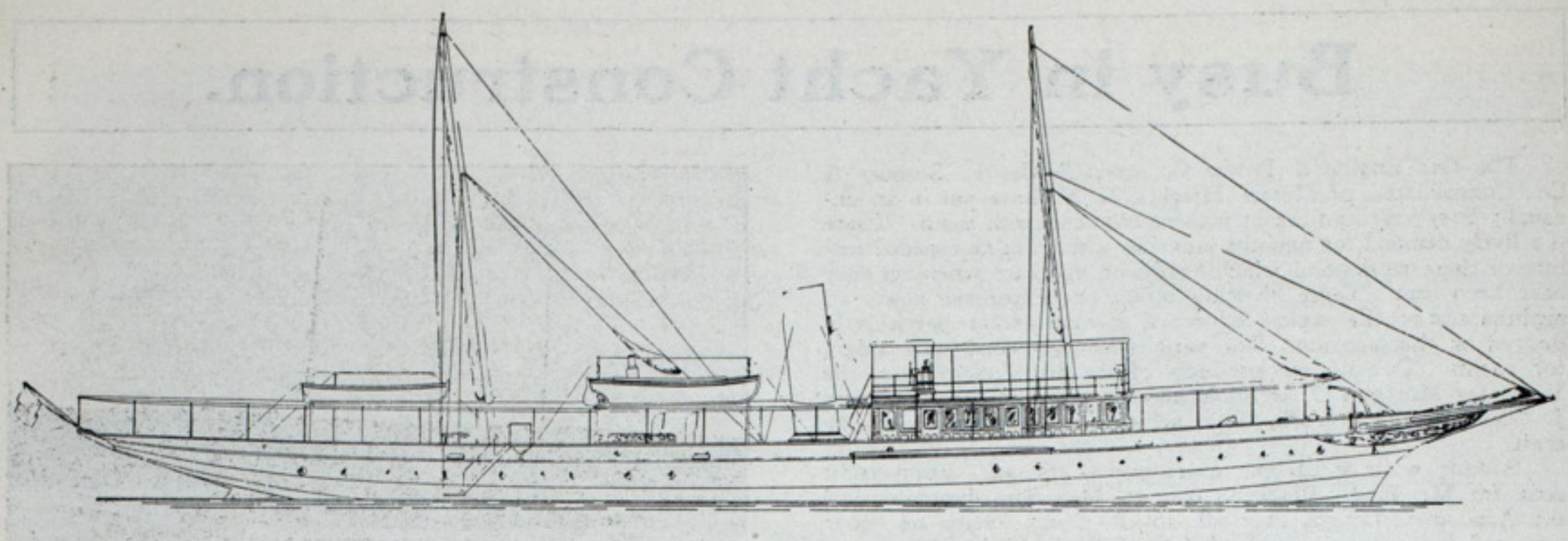
A 21-ft. Naphtha Launch, 2 H. P.

The Cherokee, building for S. H. Vandergrift of Pittsburg, Pa., is a composite yacht with wood keel and planking, steel frames, floors, keelson, clamps and stringers. The planking will be of yellow pine, bolted to frames. One peculiar feature of this yacht is a portable bow and stern, the removal of which will reduce her length to 100 ft. for passage through the canals, the owner intending to use her on the St. Lawrence river. She will have a deck house forward finished in mahogany inside and outside, and having a butler's pantry and buffet at the after end. The top of the deck house will be used as a bridge and will be covered with an awning. The owner's quarters below deck are aft, consisting of one double stateroom with toilet and bath. There will be two single staterooms for guests with toilet accommodations. There will also be a large saloon convertible into berths. The owner's stateroom will be finished in white mahogany and the other compartments in red mahogany. She will be 115 ft. long over all, 95 ft. on the waterline, 15 ft. 6 in. beam, 9 ft. 9 in. deep and 5 ft. 5 in. draught, and will be equipped with a Seabury water-tube boiler and triple-expansion engine with cylinders of 8¼, 14 and 23 in. diameter and 12 in. stroke. She will have an electric lighting plant with searchlight connection and her speed will be 16 miles per hour.



Niagara IV. for Howard Gould of New York.

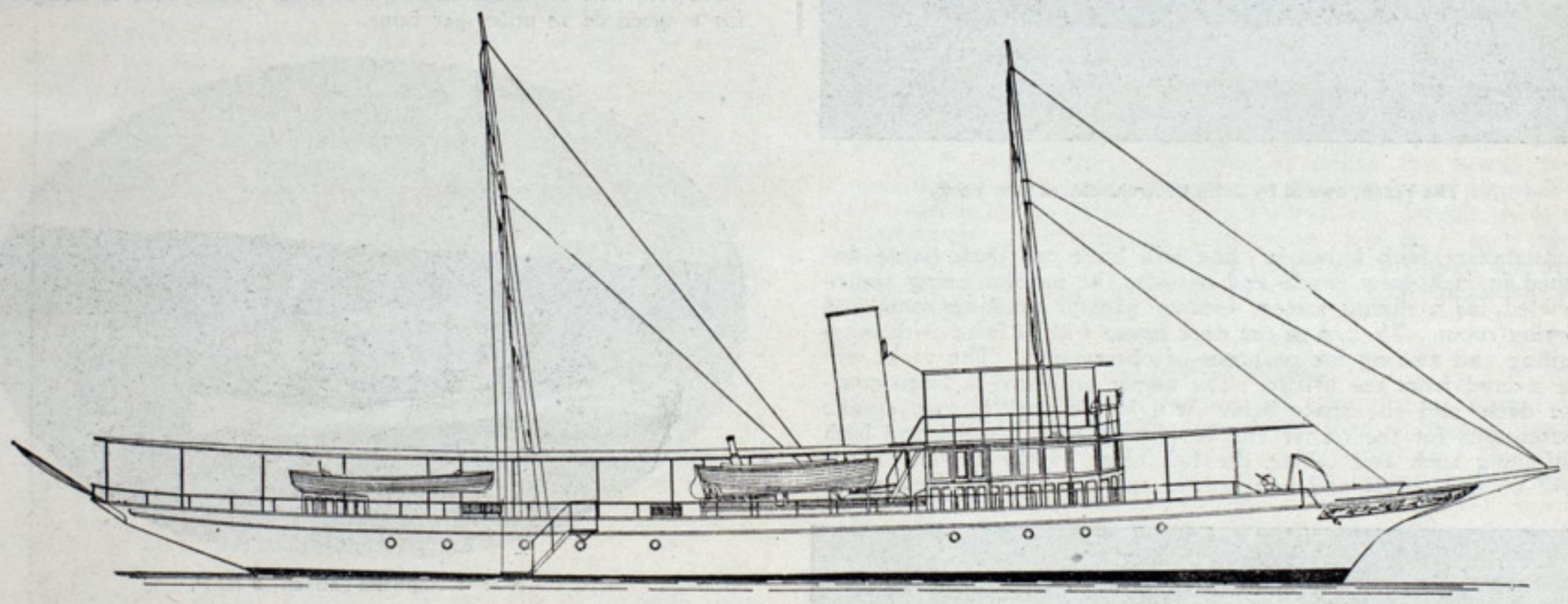
[Building by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, New York.



Aria for E. H. Blake, Bangor, Me.

[Building by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y.

The Niagara IV, which is being built for Mr. Howard Gould, is to be representative of the extreme high-speed class with great power and consequently limited quarters for owners and guests. The hull will be principally of wood with oak frames, double planking, steel floors and keelson, and steel angles throughout engine and boiler space. She is designed on the modern style of overhanging rounded bow and elliptical stern with flat bottom aft. Forward of the machinery the owner will have a breakfast room with galley adjoining. This compartment will be covered by a trunk housing. Aft of the machinery will be a large saloon with transom seats, toilet and wardrobe. The owner's quarters forward and aft will be finished in mahogany. The balance of the hold, excepting as to the forecastle, will be given to the machinery plant. Her power plant will consist of a Seabury water-tube boiler with two stacks. The yacht will be equipped with two triple-expansion engines with cylinders 8, 12¾ and 20 in. in diameter with stroke of 10 in. Her dimensions are: Length over all, 110 ft.; length on water line, 103 ft. 6 in.; beam, 12 ft.; draught, 4 ft. The speed is guaranteed at 23 miles for a run of one hour. This type of craft is now becoming quite popular for service about New York, principally by business men who wish to have quick conveyance by water and be independent of railroads. The company is now building another yacht of the same length but with 14 ft. beam which will give very good accommodations. The owner will have a deck house forward and three staterooms, bath room and saloon aft.



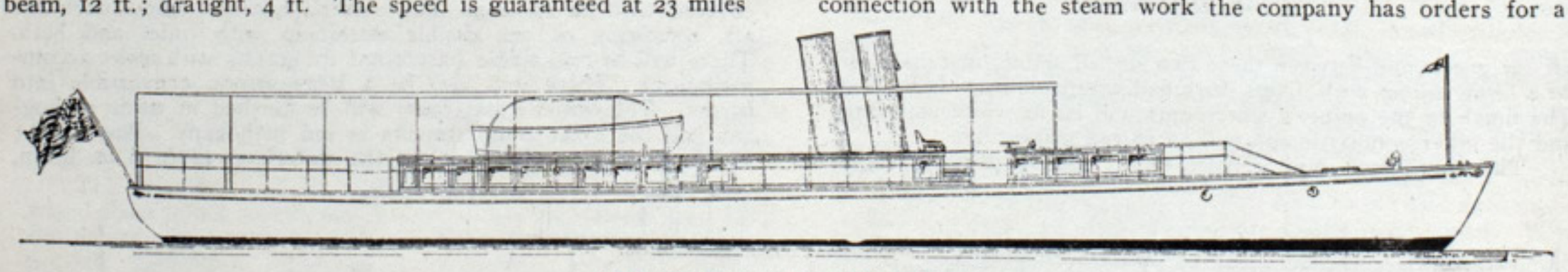
Yacht Cherokee for Mr. S. H. Vandergrift of Pittsburg, Pa.

[Building by the Gas Engine & Power Co., and Charles L. Seabury & Co. Consolidated, Morris Heights, N. Y.

The yacht, building for Mr. Alfred Marshall of New York, is similar in style and model to the Niagara and will have a speed of 20 miles for one hour. Her machinery will consist of a water tube boiler and a triple-expansion engine 7, 11¼ and 17½ in. diameter of cylinders and 10 in. stroke. Her length over all will be 90 ft., length on water line 84 ft., beam 10 ft. 6 in.

There will also be shown in a drawing in the next issue of the Review an auxiliary boat of 57 ft. which the company is now building. This type of craft has recently been in high favor by yachtsmen who have a fondness for sailing. She is 57 ft. over all, 41 ft. on the water line, 14 ft. beam, 7 ft. 1 in. deep and draws 4 ft. 6 in. of water. She has a lead keel of about 5 tons and will be fitted with a centerboard. She makes a very commodious craft, having besides the forecastle and galley, two large staterooms, a toilet and bath. saloon and engine room. The motor is one of the gasoline type, of 14 H. P. capacity, which, it is expected, will drive the boat 7 miles an hour.

The company is also turning out some especially fine naphtha launches some of which are illustrated in the accompanying article and some of which will be illustrated in a later issue. In connection with the steam work the company has orders for a yacht of 103 ft. in length, one of 90 ft. length and two of 65 ft. length in addition to those described and illustrated herewith.



Yacht for Alfred Marshall of New York.

[Building by the Gas Engine & Power Co., and Charles L. Seabury & Co., Consolidated, Morris Heights, N. Y

The Merrill-Stevens Engineering Co., Jacksonville, Fla., is building a substantial houseboat for W. B. Baker of Pittsburg to be christened the Three Kids. He has named the boat for his three grandchildren and the boat will be used by them on the St. John's river in Florida. Her dimensions are: Length, 79 ft.; beam, 15 ft.; draught, 3½ ft. This is the second houseboat the Merrill-Stevens company has built during the year, the first being the Vagabondia.

THE NEW LAKE FLEET.

The thirty-nine steel steamers of $9,565,000 value, building at the several works of the American Ship Building Co., and which are fully described on the second page of this issue, are divided among the different yards as follows: Globe yard, Cleveland, 5; Lorain, 8; Chicago, 8; Detroit, 6; Bay City 5; Superior, 4; Buffalo, 3. In this long list of freighters there is a great deal of sameness, except as regards three very large carriers building in the name of Mr. A. B. Wolvin of Duluth. It can certainly be said this year that the American company is "manufacturing ships." The three large Wolvin steamers are to be duplicates, 468 ft. over all, 448 ft. keel, 52 ft. beam and 28 ft. depth. The capacity is to be close to 7,000 gross tons. Engines will be quadruple-expansion, 15, 23¾, 36½ and 56 in. cylinder diameters, with a common stroke of 40 in. Steam will be supplied by Babcock & Wilcox water-tube boilers at 225 lbs. pressure. The cost of these vessels will probably exceed $300,000 each. Two of them are to be built at the West Superior works of the American company and the third at the Detroit works. These three steamers, as well as the three building for G. A. Tomlinson of Duluth, are to be vessels of a great number of hatches, like the James H. Hoyt—practically double the usual number of hatches. The passenger and freight steamer Tionesta, building at the Detroit works, is another vessel that is out of the ordinary in the American company's list. The Tionesta was illustrated and described in the Review of Dec. 18.

The Jenks Ship Building Co. of Port Huron has undertaken quite a job in the fast twin-screw passenger steamer which they are building for the Michigan Steamship Co. of South Haven, Mich., and which is to run between South Haven and Chicago. Twenty miles speed is expected from the steamer. She is to be 275 ft. over all, 265 ft. keel, 38 ft. beam and 28 ft. depth. Two sets of triple-expansion engines will each have cylinder diameters of 21, 34 and 56 in., with 30 in. stroke. Steam will be supplied by four Scotch boilers of 13 ft. 6 in. by 12 ft. 6 in. This vessel will probably cost $275,000.

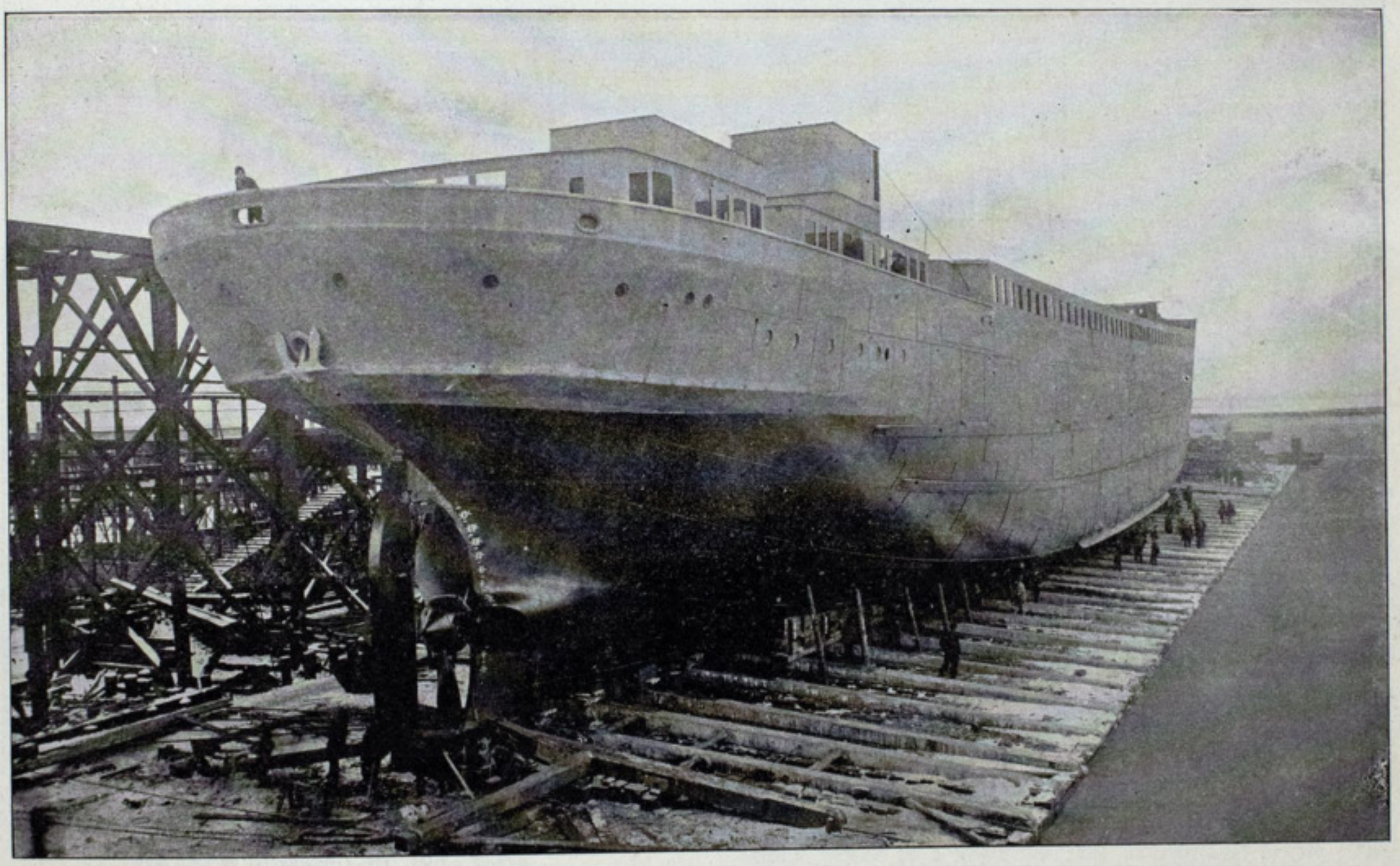
Names have thus far been selected for anv a few of the vessels building at the American company's yards. The steamer building for the Mack estate, Cleveland, is to be named for William H. Mack, who was drowned while engaged in wrecking operations off the Massachusetts coast a short time ago. Mr. H. A. Hawgood has named his steamer, launched at Lorain a few days ago, for his son, H. B. Hawgood. Four steamers building at Lorain for Capt. W. W. Brown and others, will be named Hurlbut W. Smith, Monroe C. Smith, B. Lyman Smith and Wilbert L. Smith. Two others, building at Chicago for the same fleet, will be named George B. Leonard and Charles M. Warner. Mr. C. W. Elphicke of Chicago will give the name G. Watson French to the boat building for him at Bay City. Mr. French is general manager of the Republic Iron & Steel Co. P. P. Miller is the name selected for the steamer building at Buffalo for J. J. McWilliams and otners of that city.

L. P. & J. A. Smith of Cleveland are having a dredge built of the following dimensions: Length, 120 ft.; beam, 40 ft.; depth, 12 ft. The hull will be of steel and will be built by the Forest City Boiler Works of Cleveland. A triple-expansion engine of 17, 27 and 45 in. cylinder diameters and 24 in. stroke, will be supplied by the Great Lakes Engineering Works of Detroit, to operate a 24.-in. suction pump, which will also be built at the Detroit works. A Scotch boiler, 13 ft. in diameter and 12 ft. long, will be supplied by the Lake Erie Boiler Works of Buffalo. The dredge will be put together at Buffalo.

A. P. Kenyon, Marine City, Mich., writes as follows: "I built no vessels at my yard in 1902 but repaired the following vessels, some of them receiving quite extensive repairs: Steamers Concord, Sparta, Havana, Liberty, Thomas Scott, George King, John J. Hill and Sawyer; also barges Redfern, Tuxbury, Wanderer, Montana, Homer, Albany, Kate Darley, Ketchum, Argonaut, Knapp, Casey and McBrier. I also converted the tug Harley into a passenger ferry, with all upper works new. I am at present repairing the following vessels: Steamers S. K. Martin, Concord, Sparta, Thomas Scott and Havana; barges Alex. Anderson, Harvey Kendall, Magnetic and Biwabik."

It is understood that the Manitowoc Dry Dock Co. of Manitowoc, Wis., is to build a small passenger steamer—about 150 ft. length—for A. E. Cartier of Ashland, Wis. The Manitowoc works, which are very well equipped and well located for repairing both wood and steel vessels, has a large amount of repair work under way.

All reports from Buffalo regarding contracts with the Empire Ship Building Co. of that place for new steel tugs are premature. The Empire company has done some figuring on that score but has no orders as yet.



The Anchor Line Steamer Tionesta on the Ways.

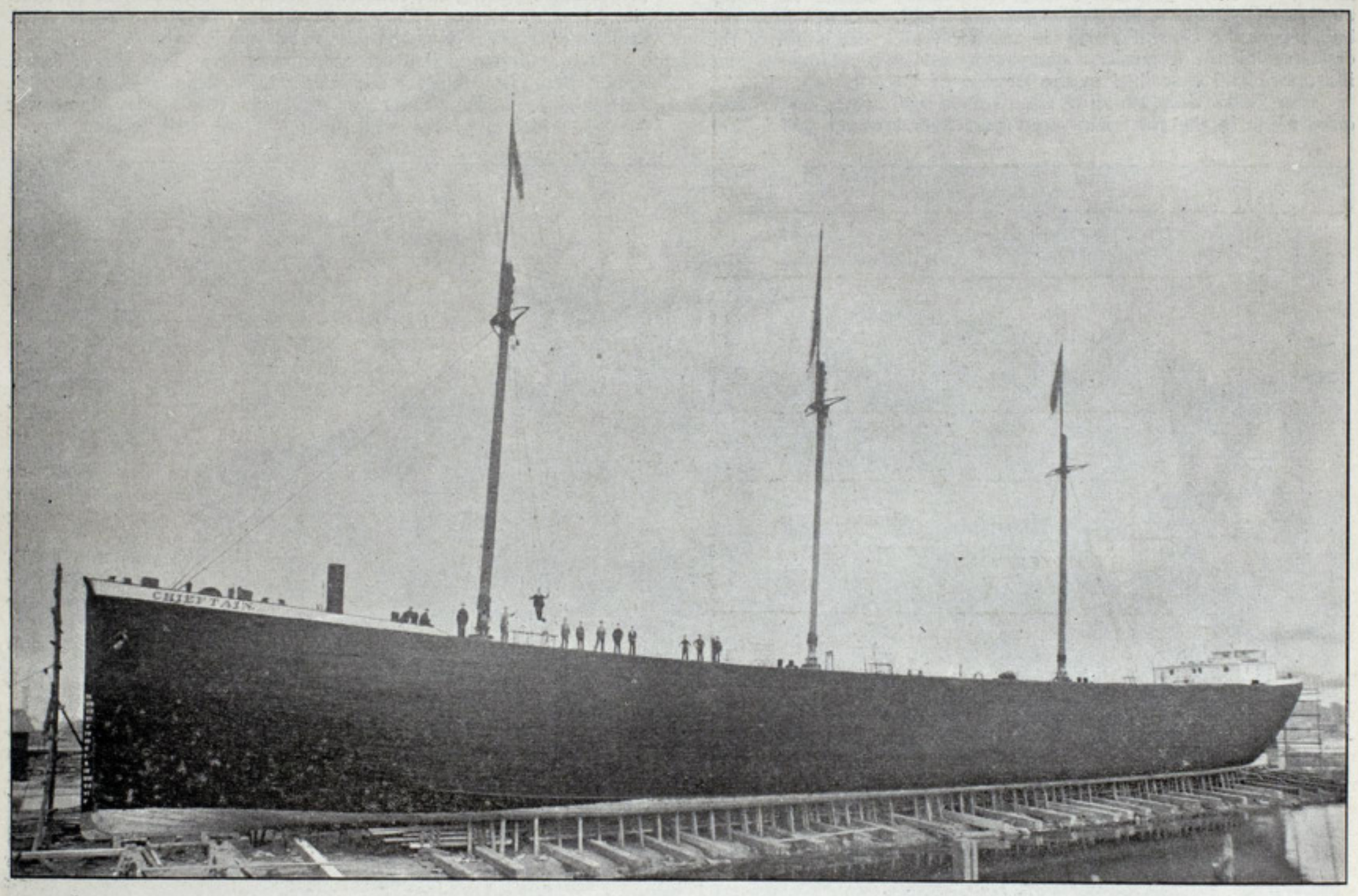
Photograph Copyrighted by Detroit Photographic Co., Detroit, Mich. [*Building by the Detroit Ship Building Co., Detroit, Mich.*

The freighter Moses Taylor had the honor last week of carrying the first load of iron ore to the new plant of the Lackawanna Steel Co. at Buffalo. The Taylor had tied up at the Minnesota ore docks with a cargo of 6,200 tons of ore when it was decided to have her deliver it to the steel plant. It was not generally known that the work on the canal had been sufficiently developed to permit the passage of boats but work upon it has been greatly rushed. The Taylor worked her way up the canal with the assistance of a couple of tugs. Every whistle in the big steel plant saluted as the steamer forged slowly to the docks where the Hulett automatic unloaders are. These unloaders operate in conjunction with a conveyor which leads directly to the furnaces. This ore will be used to make the first steel at the plant.

WAGES ON CORPORATION SHIPS.

Mr. A. B. Wolvin, general manager of the Steel Corporation fleet of vessels on the lakes, is taking steps early in the matter of arranging wages and making contracts with captains and engineers for next season. Capt. W. W. Smith, marine superintendent, announces that the captains of all the vessels are to be paid an advance of 10 per cent. in wages for 1903. The masters of the barges now get $100 per month and the men in charge of the steamers of the largest class get about $1,800 a season, so that the advance will amount to more than $100 a year per man. It is also announced that both captains and engineers are to again be paid bonuses (on the merit system) for the season just closed. The amounts have not been figured up as yet but it is expected that the checks will be distributed shortly.

The question of engineers' wages for next season is also reported as settled between Chief Engineer Joseph F. Hayes of the Corporation fleet and vice president Jenkins of the Marine Engineers' Beneficial Association. The basis of settlement is the following schedule: First-class steamers, chief engineers, eleven months, $1,650; first-class steamers, chief engineers, ten months, $1,500; third-class steamers, chief engineers, ten months, $1,350; first-class steamers, first assistant, eleven months, $1,100; first-class steamers, second assistants, eleven months, $325; second-class steamers, assistant, ten months, $1,000; third-class steamers, assistant, ten months, $900. It is also agreed that the steamship company will place second assistant engineers on all steamers on which the company may have installed automatic stokers. Payments will be made the same as during the past year, that is, monthly by a check from the office of the company; first payment to be made Mar. 1. In addition all men signing contracts according to this agreement and continuing in the employ of the company will be entitled to the bonus which the company offers for faithful service, for continuing in the employ of the company and for living up to the rules and regulations made by the company from time to time.



A Wooden Barge of about 5,000 Gross Tons Capacity.

The only wooden vessel now building on the lakes is a duplicate of the Chieftain, shown in the engraving, and which is owned, with a large fleet of similar vessels, by James Davidson, ship builder, of Bay City, Mich.

AFFAIRS AT THE HEAD OF THE LAKES.

Duluth, Dec. 30.—The Pittsburg Steamship Co., which is to have the whole of the seventh floor of the new building erected for the use of the United States Steel Corporation, will soon be settled in their new quarters. The building is so far along that some of the western offices of the Steel Corporation are already getting in. This building is on First street, at the corner of Third avenue, west, is very central and contains about an acre of floor space. It is a model office building, of steel construction with columns incased in concrete.

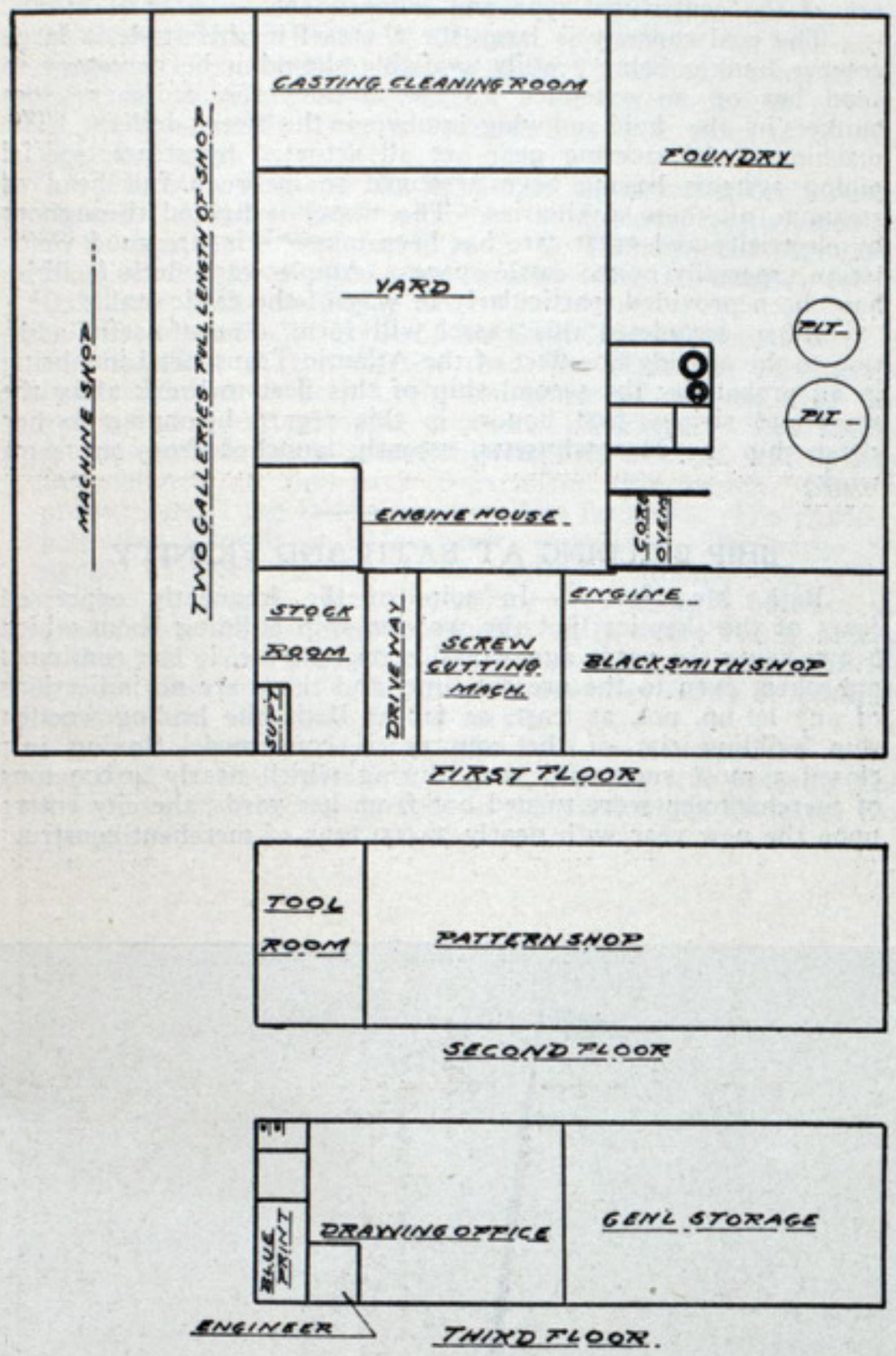
From this time on the grain business at the head of the lakes will be slow until the opening of navigation in 1903. Receipts are small, of wheat especially so, and shipments are merely nominal. The contrast in wheat receipts against this time last year is most marked. Then the stocks here showed an increase of 1,336,000 bu.; last week only 308,958. At this date last year there were in store and afloat for winter storage at the head of the lakes, 10,819,603 bu. of wheat. Now the corresponding total is about 3,750,000 bu. No ships are storing wheat for spring delivery, and there will be no inducement to do so. Not all the elevators will be open. The Globe company's three houses have now been closed down and are in charge of watchmen and firemen for the winter. There is nothing to keep them open for. Receipts of wheat at the Canadian head of the lake ports, Fort William and Port Arthur, are active and the two Canadian roads are carrying there as much as they can well handle and deliver. Storage is the thing that will bother these ports this winter, and this is increasing far more slowly than was anticipated, on account of unexpected delays.

The number of ships laid up at the head of the lakes is an imposing total, and as the items comprise what is largest and most modern in the way of great lakes shipping, it is an especially interesting total. This plan of laying by ships at this end of the lakes is destined to increase in favor, especially as the business of Chicago falls further and further behind this section.

The total product of sawmills at Duluth-Superior for the year, including only those mills that are on deep water and ship by lake, was 442,600,000 ft. The product of surrounding mills, in what is known as the Duluth district, was about 400,000,000 ft. additional. A considerable part of the product of the latter is shipped by lake. Combined this is far more than the annual product of any pine district in the world. There are three Duluth mills in operation now, and three more are to start up as soon as they can be got ready, all for a continuous run to the close of 1903. These will insure a larger cut the coming year than has ever been made in this district, and a chief part of the increase is to go out by lake. The cut of 1902 was about 4 per cent. greater than that of the preceding season and exceeded any prior year. The Duluth & Iron Range road, belonging to the United States Steel Corporation, will this winter haul more than 275,000,000 ft. of logs, mostly to mills in this city. This business is done at a time when that for which the road was built—ore traffic—is impossible, and it adds materially to the revenues of the system. It is the chief log hauling line in existence. Despite the enormous annual cut there is timber enough along this road to permit the maintenance of such an annual traffic for many years.

ENLARGEMENT OF DETROIT SHOPS.

About $75,000 is being spent in making important additions to the shops of the Detroit Ship Building Co. at Orleans and Atwater streets in Detroit. The work is nearing completion. A rough sketch of the shops is shown herewith. The improvement in brief is a three-story addition, 172x49 ft., to the Detroit com-



pany's machine shop, the new structure including enlargement of foundry, smith shop, store room, etc., on the ground floor, and large new pattern shop on the second floor with spacious drawing office and general storage above. With the machine shop, which was already practically a new, well-equipped structure, the building covers an area of 200 by 238 ft., surrounded on three sides by wide public thoroughfares, with the best of railway connection on the fourth side. The Detroit company now certainly has a well-arranged plant for its marine engine work, which means, of course, foundry, smith shop and other necessary adjuncts. The new foundry is 75x151 ft.; smith shop, 49x86 ft.; pattern shop, 140x40 ft., and drawing office, 70x49 ft. The plan shows the general arrangement quite clearly.

NEARLY THIRTY-SIX MILLIONS.

Reports from the canals at Sault Ste. Marie showing a total of nearly 36,000,000 net tons of freight moved to and from Lake Superior during the season of lake navigation just closed were not of special interest, as it has been known for several weeks past that the thirty-five million mark would be exceeded. The exact figures as to the freight movement are 35,961,146 tons for 1902, compared with 28,403,065 tons in 1901. The shortage of coal in the northwest is clearly reflected in these final canal reports. Only 309,948 tons of hard coal went forward in 1902, as against 804,493 tons in 1901. Soft coal shipments, aggregating 4,502,530 tons in 1902, are 713,887 tons in excess of the shipments of 1901, but this increase is not by any means sufficient to meet the requirements. There will be no coal at Lake Superior ports in the spring. A brief summary of the Sault traffic follows:

	1902	1901
Number of passages	22,659	20,041
Reg. tonnage of vessels	31,955,582	24,626,976
Tons of freight, net	35,961,146	28,403,065

The canal reports will be discussed in detail in the next issue of the Review.

Engineers of the Gilchrist vessels presented Mr. J. C. Mitchell, chief engineer of the fleet, with $250 in gold last week.

CARGO RECORDS OF LAKE FREIGHTERS.

A comparison of records show that a mistake was made in saying that the cargo of 7,659 net tons of soft coal loaded at Lorain recently by the steamer John W. Gates, was not a record cargo. The steamer I. L. Elwood in 1901 loaded a larger cargo of hard coal at Buffalo (7,688 net tons), but the Gates now holds the record in soft coal. Record cargoes of ore, grain and coal revised to date, are:

Iron ore—Steel tow barge John Smeaton, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,652 gross or 8,570 net tons, Two Harbors to South Chicago; steamer Isaac L. Elwood, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,642 gross or 8,559 net tons, Two Harbors to Conneaut.

Grain—Steamer S. J. Murphy, Donora Mining Co., Duluth, 269,000 bushels of corn, equal to 7,532 net tons, South Chicago to Buffalo; steamer Douglas Houghton, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 308,000 bushels of clipped oats and 60,000 bushels of corn, equal to 7,520 net tons, Manitowoc to Buffalo.

Coal—Steamer I. L. Elwood, owned by Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,688 net tons anthracite, Buffalo to Duluth; steamer John W. Gates, Pittsburg Steamship Co., A. B. Wolvin of Duluth, manager, 7,659 net tons of bituminous, Lorain to Duluth.

AROUND THE GREAT LAKES.

The annual meeting of the Licensed Tugmen's Protective Association will be held at Milwaukee on Jan. 20.

The Lehigh Valley Transportation Co., which for two seasons has been under the management of vessels of the Erie railroad line, has been returned to the management of the Lehigh Valley Railroad Co. with L. H. Van Allen as the official head.

A traffic report from Tonawanda shows that about 407,000,000 ft. of lumber were received there during the season and 230,500 tons of ore unloaded at the docks of Tonawanda Iron & Steel Co. During 1901 447,000,000 ft. of lumber were received at the port.

Fire broke out in the machine shop of the Jenks Ship Building Co., Port Huron, Mich., early Monday morning and did considerable damage. The fire started in the pattern shop, which was pretty thoroughly destroyed before the fire could be checked. An aggravating feature of the loss is the destruction of patterns for the engines of the new passenger steamer building for the Michigan Steamship Co.

The steamer John Spry has filed a salvage claim of $5,000 against the Colonial. The Colonial loaded coal for Milwaukee at a Lake Erie port. She was considerably damaged in passing through St. Clair flats and put into Manitowoc for repairs. Afterwards with the assistance of the John Spry she started for Milwaukee. For their work in assisting the vessel the crew of the John Spry has entered a salvage claim for $5,000. It will be contested as unreasonable.

The Champion Iron Co. has sold its iron ore properties in Marquette county, Michigan, to the Clairton Steel Co., a controlling interest in which is held by W. P. Snyder and Henry Oliver of Pittsburg. The price paid is about $1,600,000. Previous to the sale over two-thirds of the stock of the Champion Iron Co. had been deposited with H. H. Fay and associates to effect a transfer of the property. The par value of the stock is $25 a share and there are 20,000 shares, so that the purchase price is quite favorable to the stockholders.

While in Buffalo last week Congressman Burton announced that the government had provided for a survey for a one-mile deep water slip canal connecting Buffalo harbor with Black Rock and all the ports on the Niagara river below that point. For the dredging of Black Rock harbor $800,000 has already been appropriated. What is proposed to do is to deepen the present strip of water known as Black Rock harbor from its entrance in the Buffalo harbor to a point near the international bridge. This waterway lies parallel with Niagara river west of the Erie canal. At the international bridge a lock would be built. The reason why lake vessels do not venture down the Niagara river now is that that portion of it from its mouth to Black Rock is filled with rocks and is possessed with a treacherous current. Below Black Rock the river becomes deep, the water smooth and safe for all vessels. The one-mile waterway proposed will circumvent the dangers of this portion of the river.

Mr. James Corrigan recently took occasion in Duluth to deny reports that the United States Steel Corporation is negotiating for the mining properties controlled by Corrigan, McKinney & Co. He said that his company is well satisfied to continue in the mining business and does not desire to sell. Mr. Corrigan made some interesting observations as to the output for next year. He says he does not look for a large increase over the output of 1902 owing to the fact that the mines were crowded pretty hard in the past year. Moreover, 1002 was a very long season. "Another thing," he said, "which will tend to hold down the increase in the movement of ore in 1903 is the fact that ore has not been consumed to the extent expected this year, owing to the scarcity of coke. Some of the furnaces were compelled to go out of blast on this account. The coke famine was responsible for the importation of much pig iron into the country. Had there been an ample supply, the furnaces all over would have been continuously active."

FINE STEAMSHIPS FOR THE ATLANTIC TRANSPORT LINE.

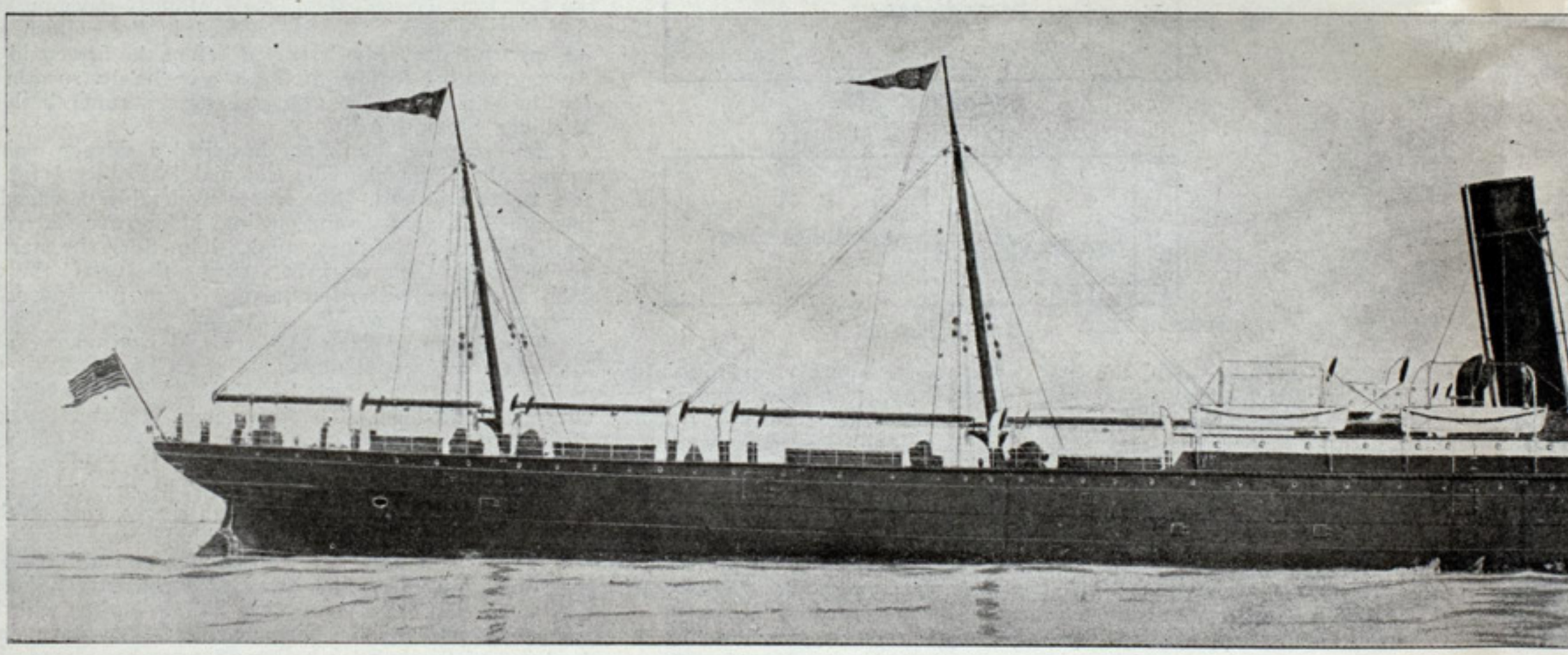
One of the most notable of December's launches was that of the magnificent steel twin-screw steamship Mississippi, launched from the works of the New York Ship Building Co., Camden, N. J. This vessel is the second of two of the same type building at this yard to the order of the Atlantic Transport Line for their cattle and freight service, and in this connection it may be stated that this is the third steamer that has been launched from this works during the last three months, making a total of over 25,000 tons gross, or an average of about 8,400 tons. As regards type she follows the now accepted standard for this class of work, being a three-deck vessel with a complete shelter deck, and large bridge amidships on this deck. She is being built under the special survey of, and to take the highest classification in, the American Record and Lloyd's Register, her principal dimensions being as follows: Length, 505 ft. 6 in.; breadth, 58 ft. 3 in.; draught, 27 ft.; gross tonnage, about, 8,400.

The Mississippi is rigged as a four-masted schooner, each mast carrying several large and powerful derricks for the rapid handling of freight. The ballasting arrangements are most complete, the vessel being provided with two large deep tanks besides a cellular double bottom. The officers have commodious quarters in the bridge house amidships, the executive officers are located at the fore end of the house, the quarters including a handsomely furnished saloon with staterooms readily accessible therefrom. The engineers are located at the after end of the house, their quarters being adjacent to the engine and fire room entrances. The captain's cabin is on the bridge deck, immediately abaft the chart room, and within easy reach of the navigating stations. The petty officers and crew are berthed on the upper deck, right forward, the foremen-cattlemen and horsemen being situated on the same deck aft, with cattlemen and horsemen forward on the middle deck. An hospital is fitted up on the upper deck aft, together with storerooms and a house for the steering gear. The arrangements for the safe carriage of a large number of cattle and horses are most complete and have been fitted up in accordance with the regulations of the United States department of agriculture and of the British board of trade. The cattle and horses are all carried on the upper deck, with the exception of a few cattle in the bridge house, provision being made for about 750 head in all, of which over 50 are horses. The freight handling appliances are, as already stated, of the most complete and up-to-date character, special care having been taken to provide ample winch and boom facilities to insure rapid discharge and lading.

The ship's boilers are of the Scotch type, two being double-ended, two single-ended. The two single-ended boilers are placed back to back amidships. The former have each three Morrison corrugated furnaces, the latter each six Morrison corrugated furnaces. They are designed for 200 lbs. working pressure and to use heated forced draft. The engines, two in number, are of the triple-expansion type. They are designed for seventy-five revolutions per minute, and each engine will operate a shaft of Bethlehem open-hearth steel, carrying a four-bladed propeller 16 ft. 6 in. in diameter. The circulating pumps are of the centrifugal type and independent.

The coal capacity is large for a vessel in this trade, a large reserve bunker being readily available should it be necessary to send her on an extended voyage, besides the ordinary cross bunkers in the hold and wing bunkers in the 'tween decks. The machinery and steering gear are all actuated by steam, special piping systems having been arranged to insure a full head of steam to all these auxiliaries. The vessel is lighted throughout by electricity and great care has been taken to insure good ventilation especially in the cattle spaces. Ample wash deck facilities have been provided, particularly in way of the cattle stalls.

When completed this vessel will form a most useful addition to the already fine fleet of the Atlantic Transport Line, being in all probability the second ship of this fleet to break away the stars and stripes, first honors in this regard belonging to her sister ship the Massachusetts, recently launched from the same works.



THE ATLANTIC TRANSPOR

SHIP BUILDING AT BATH AND VICINITY.

Bath, Me., Jan. 1.—In spite of the frequently expressed fears of the skeptics that the wooden ship building boom which began some six years ago would soon be over, it has continued unbroken, even to the present time, and there are no indications of any let-up, not, at least, as far as Bath, the leading wooden ship building city of the country, is concerned. Having just closed a most successful year, during which nearly 40,000 tons of merchantmen were turned out from her yards, the city enters upon the new year with nearly 22,000 tons of merchant construction in her yards and under contract, and with naval vessels in course of construction at the Bath Iron Works aggregating more than 18,000 tons displacement, and good prospect of securing some of the profitable contracts soon to be awarded by the navy department.

The list of vessels now on the stocks in the district or soon to be placed on the stocks is as follows:

No.	Rig.	Material.	Gross Tons.
2	Barges	Wood	5,500
2	Five-masted schooners	Wood	3,800
4	Four-masted schooners	Wood	3,750
3	Three-masted schooners	Wood	1,240
1	Five-masted schooner	Steel	3,500
1	Barge	Steel	2,300
1	Caisson	Steel	1,000
			Displacement.
1	Battleship	Steel	15,000
1	Cruiser	Steel	3,235
	Total (gross tonnage and displacement)		39,325

This is an unusually good showing for the opening of the year, sixteen vessels in all, and as it takes only from three to six months to build a wooden vessel of considerable size, there

is good prospect of the record of 1902 being equalled or exceeded by that of 1903. The catalogue of construction in hand by yards is as follows:

The Kelley-Spear Co. is building for the Baltimore & Boston Barge Co. a barge 230 ft. long, 45 ft. beam and 19 ft. deep with a carrying capacity of 3,000 tons; for J. S. Emery & Co. of Boston a four-masted schooner 163 ft. long, 37 ft. beam and 17 ft. 5 in. deep, of 850 gross tons. This latter vessel will be commanded by Frank W. Gorham, formerly of the bark Hiram Emery. This month the Kelley-Spear Co. closed a contract with Capt. G. W. Elzey of Bethel, Del., for a four-masted schooner of 700 tons, 170 ft. long, 37 ft. beam and 13 ft. deep, to be ready in June, 1903.

The New England Co. has under construction the following vessels: A four-masted schooner 181 ft. long, 39 ft. beam and 18 ft. deep, 1,100 tons, for Capt. S. C. Thompson of Matteawan, N. J.; a barge of 2,500 tons capacity (220 ft. length) for the Baltimore & Boston Barge Co.

President E. W. Hyde of the Bath Iron Works states to the correspondent of the Review that that plant has contracts on hand sufficient to keep 1,000 men employed for the next three years and every prospect for new contracts. The monitor Nevada, which had a successful trial trip Dec. 17, will be ready for delivery to the navy department this month. She has proved herself the fastest monitor thus far tried. The 15,000-ton battleship Georgia is 18 per cent. completed. The barge Shenango, of steel, for the J. M. Guffey Petroleum Co. will be finished in March. Her dimensions are: Length between perpendiculars, 298 ft.; breadth, molded, 44 ft. 6 in.; height, between decks, 7 ft.; load draught, 18 ft.; gross tonnage, 2,200 tons. The cruiser Cleveland is in the water and will probably be ready for her trial trip some time in the spring.

Capt. James W. Hawley, who built the four-masted schooners Fred A. Davenport and May V. Neville, will probably build a five-masted schooner in 1903 in the yard which he leases from Houghton Bros.

The firm of Arthur Sewall & Co. which changed from wood to steel ship building about ten years ago, have a five-masted schooner, the first of this rig to be built of steel in this country, well under way. She will be ready to launch in the spring. Her dimensions are: Length of keel, 255 ft.; beam, 45 ft.; depth, 26 ft.; half girth, 43 ft.; capacity, 3,500 tons on 21 ft. draught.

Percy & Small who have constructed, largely for themselves, one of the largest fleets of big schooners added to the American merchant navy in recent years, are engaged at present upon a four-masted schooner of 1,100 tons. She will be 180 ft. long, 38 ft. beam and 21 ft. deep.

G. G. Deering will have a five-masted schooner of 1,900 tons ready to go overboard in March. She is for Capt. J. E. Ross. Her measurements are: Length, 233 ft.; beam, 44 ft.; depth, 25 ft.

Elwell S. Crosby has the frame ordered for a four-masted schooner of 994 gross tons, a duplicate of the Frank T. Stinson, which he built in 1887. He has leased the Reed yard at the south end of the city for her construction.

Charles V. Minott of Phippsburg in this district, the next town to Bath on the Kennebec, is building a five-master, a duplicate of the vessel which G. G. Deering of this city is building.

Frank S. Bowker, also of Phippsburg, has contracts on hand for a trio of three-masters, one of 480 tons and the others of 380 tons each. These three craft will keep his crew busy for the coming year. The frame for the first of the three has arrived and the molds for the second have been sent into the woods.

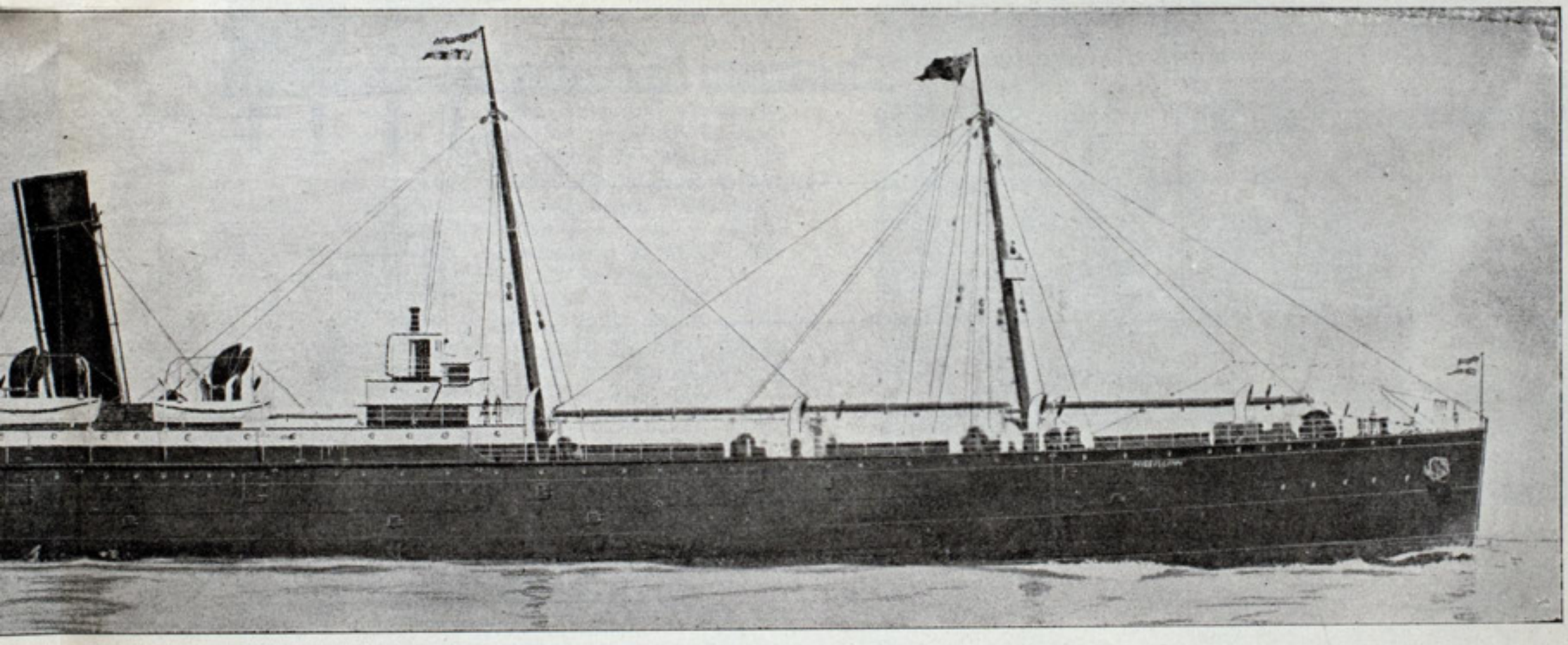
NEW YORK HARBOR NOTES.

New York, Dec. 31.—The Allan-State Line steamship Mongolian, arrived in New York harbor Dec. 20, announcing her coming by the aid of a Hamilton-Foster "diaphone" fog horn, being the first vessel to arrive at this port equipped with this device for making long distance noise. This fog horn is a joint English and American invention, an Englishman having discovered the principle upon which it works and a Yankee furnishing the genius to make it applicable to its present uses on lighthouses and ships. This fog horn is manufactured by the Hamilton-Foster Fog Signal Co., whose main office is at No. 11 Broadway, New York. They have lately received an order from the Canadian government for a 3-in. fog horn plant, which is to be placed at Metaghan, N. S. One of the company's "diaphone" fog horns has been placed on the steamer Plymouth of the Fall River Line, which has been undergoing repairs, and its far reaching notes of warning will soon be heard awakening the echoes on Long Island sound in times of need. They also make the compass fog horn signal, which can be revolved so as to send the sound in any desired direction from lighthouse or ship, and when used on lighthouses all the sound goes seaward, so that persons on land are in no wise disturbed by it. This signal, it is claimed, can be distinctly heard for a distance of from 10 to 20 miles, depending on direction of the wind and state of the atmosphere. Besides these they make a fire signal horn for use in small cities and towns, which is rapidly coming into favor.

Competitive bids were opened at the war department, Washington, D. C., Dec. 22, for repairs on the United States transport Kanawha, consisting of a general overhauling in the engine and deck departments. Several bids were received, as the competition for this class of work seems to be quite keen of late. Among those bidding were the James Reilly Repair & Supply Co., New York; Pusey & Jones Co., Wilmington, Del.; Morris Heights Gas Engine & Power Co.; Verder & Co., Staten Island; Kensington Ship Yard, Philadelphia; Burlee Dry Dock Co., Staten Island, and the Perth Amboy Ship Building & Engineering Co., Perth Amboy. N. J. When the bids were opened it was found that the latter company had obtained the Christmas present. Some surprise was manifested, and more or less importance attached to the fact that a new company like the Perth Amboy should secure this order in a competition with firms of long standing and who are well versed in this class of work.

The Marine Construction & Dry Dock Co. of Mariner Harbor, Staten Island, has secured the contract for overhauling and refitting the hull and engines of the government harbor boat Barry. The boat is to be ready for service before Feb. 1. In the meantime another boat is to be chartered to take her place.

The Red Star Line announces that the steamships Kroonland sailing from New York Jan. 3, Finland on Jan. 17 and Kroonland Jan. 31, will take mail and passengers for Southampton.



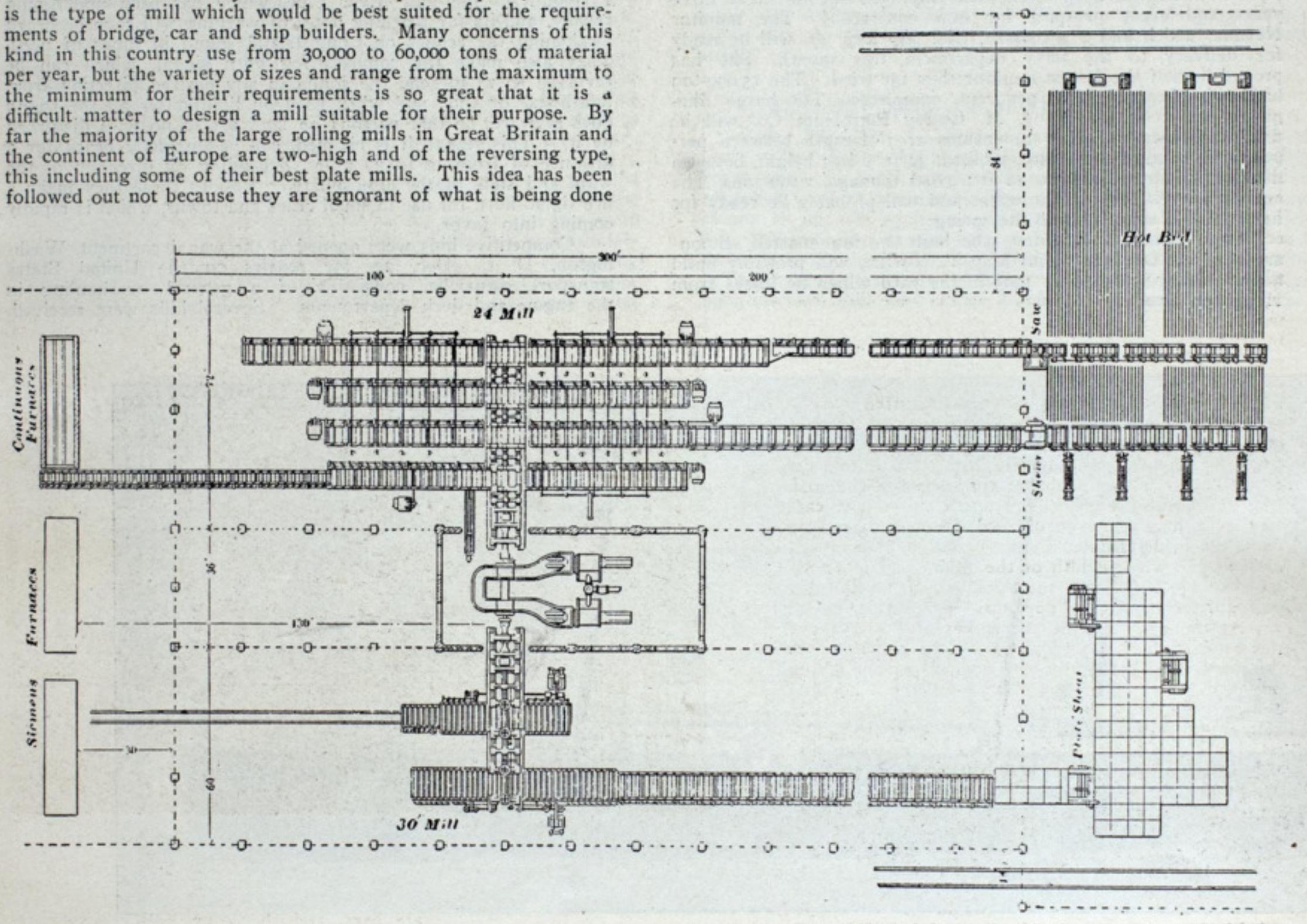
TRANSPORT LINER MISSISSIPPI. [*Building by the New York Ship Building Co., Camden, N. J.*

COMBINATION PLATE AND STRUCTURAL MILL.

In an article prepared recently for the Iron Trade Review, Mr. Wm. Garrett of the Garrett-Cromwell Engineering Co., Cleveland, gives his views regarding a kind of mill that would be especially suited to the requirements of bridge builders, ship builders and car builders. Mr. Garrett says:

"One of the strongest reasons given by foreign iron and steel manufacturers for the large production of our American rolling mills is that there is a greater demand in this country for steel bars, etc.; therefore the mills can run on the same size longer than they can without changing sizes or rolls. This is true to a great extent, and one has only to see what is being done in such mills as Jones & Laughlins' and that at the Duquesne works, which are especially designed to make a certain range of bar sizes. There it is a common thing to give an order for from 500 to 1,000 tons of a certain size to be filled without change; and while such mills are suitable for such purposes they are not at all suitable for the general trade where sizes in small lots are required.

"In this article I only wish to touch upon one point, and that is the type of mill which would be best suited for the requirements of bridge, car and ship builders. Many concerns of this kind in this country use from 30,000 to 60,000 tons of material per year, but the variety of sizes and range from the maximum to the minimum for their requirements is so great that it is a difficult matter to design a mill suitable for their purpose. By far the majority of the large rolling mills in Great Britain and the continent of Europe are two-high and of the reversing type, this including some of their best plate mills. This idea has been followed out not because they are ignorant of what is being done



in this country, where the prevailing type is three-high, but because they believe a reversing, two-high mill to be most suitable for their purpose, as they could change rolls in less time than on a three-high mill, and could also construct and operate cheaper.

"While it is true that on some of our three-high rail mills—for making nothing but rails, beams and channels, and some angles—less labor is required, the demand upon foreign makers is not such as to warrant them putting up special three-high mills for special purposes. They selected the two-high reversing mill; and I may say here their requirements are on a par with the present requirements of our bridge, ship and car builders, viz., a great variety and a limited tonnage. That such is the case can be proven by the many inquiries there are for a mill to meet this peculiar requirement.

"To fill this want is suggested a mill as shown in the drawing, which is a general plan of a 24-in., two-high, reversing bar mill and two-high, 30-in. reversing plate mill, both driven by one engine and arranged so that they can both be fed by the same heating furnaces, if desired. This mill is meant to meet the needs of those who require from 40,000 to 60,000 tons per annum, and require the material for their own use. This arrangement of rolling mill can make all sizes except those under 1½ in. round or square which may be required, but which constitute a small percentage of the tonnage required for either bridge, car or ship building. It will be observed by examining the illustration, that there is a plate mill attached to this plan. On this mill plates can be rolled up to any width and thickness called for, thereby giving all the sizes of bars and plates required from one plant, only requiring one engine and heating furnace for both merchant and plate mill, and the same crew can operate both mills.

"It might be said, What about your raw material? Where are you to get your blooms and slabs? Having this train and the addition of an open-hearth steel plant with or without a blooming mill is all that is necessary. All this can be accomplished for an amount less than $1,000,000. And when the concerns using large quantities of structural steel come to think that they can with this amount of capital erect a plant suitable to fill their requirements, and taking into consideration the many millions of dollars that have been expended on the large steel works which now furnish them this material—also the enormous extent to which some have watered their stock—it is evident this article will be for them at least food for thought."

DEARBORN DRUG & CHEMICAL WORKS.

The Dearborn Drug & Chemical Works, whose general offices and works are at Chicago, are just completing a large addition to their already extensive factory at 2325-2329 La Salle street, Chicago. This gives them a plant of five stories, 200x300 ft. The business of the Dearborn company in the manufacture of boiler compounds for the treatment of feed water supplies has steadily increased for the past fifteen years. Officials of the company say that the 1902 increase over the year previous was some 30 per cent. General offices of the company occupy a quarter floor of the Rialto building in Chicago. The general laboratory is also located in the Rialto building, and is the most completely equipped analytical institution in the country. Besides making a specialty of water analyses the company is specially equipped for testing oils, coal, fuel, steel, brasses, ore, etc.; in fact all branches of chemistry. There are eleven offices outside of Chicago, located in New York, Pittsburg, Cincinnati, Atlanta, Detroit, St. Louis, St. Paul, Denver, Los Angeles, San Francisco and Honolulu. The output for the past year was about 10,000,000 lbs. of boiler compounds. The lubricating oil business of the company has increased in like proportion. High-class oils, quality rather than quantity, is the Dearborn policy.

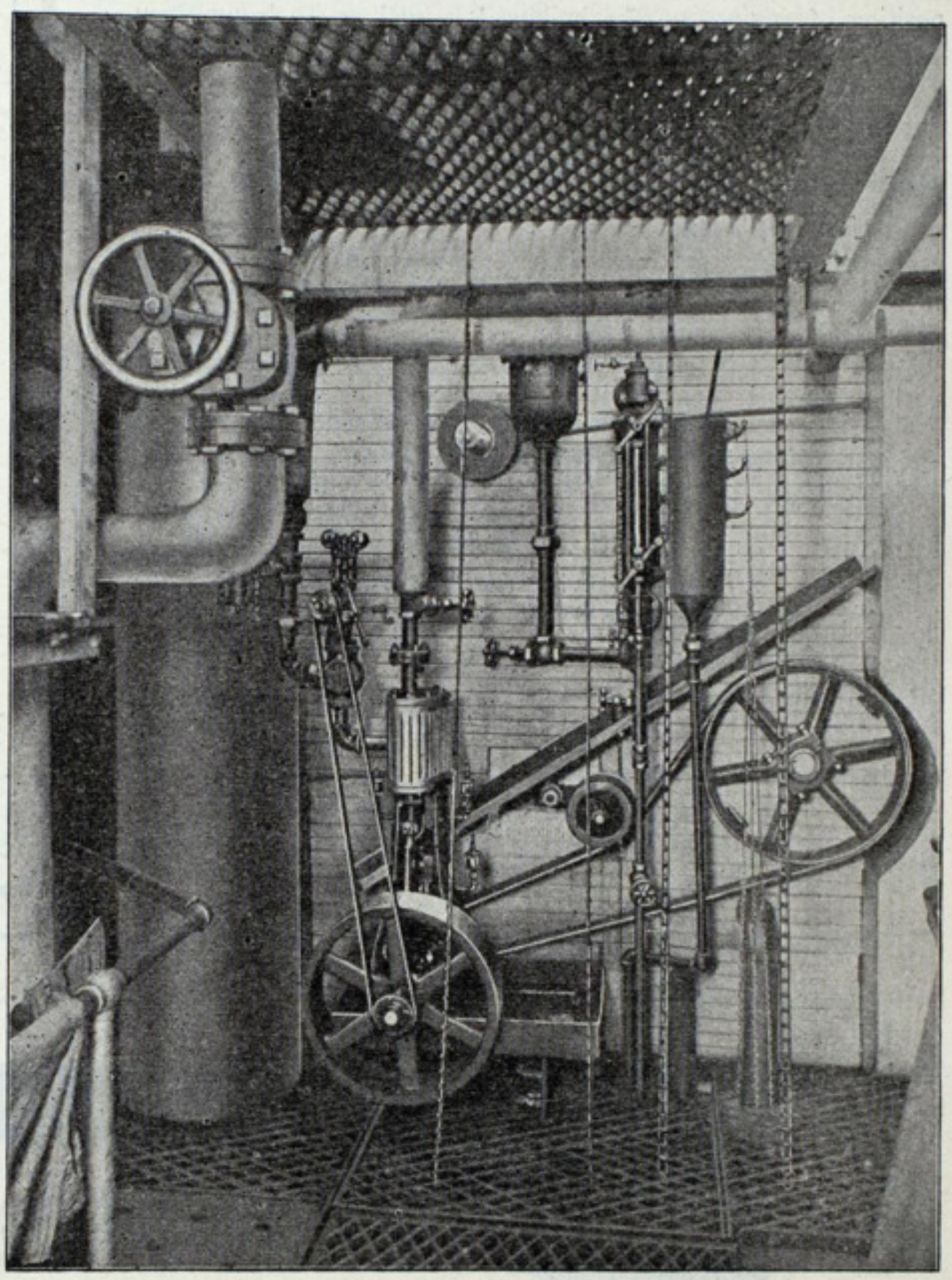
Owing to the temporary financial embarrassment, the W. R. Trigg Co., Richmond, Va., has gone into the hands of a receiver. Mr. L. T. Myers, vice president of the company, was appointed receiver by the chancery court. Claims amounting altogether to $150,000 were filed by Richmond creditors. Mr. Myers believes that he will be able to discharge the corporation from the receivership in a short time. Mr. Myers issued a statement in which he said that the embarrassment is due to losses sustained in building torpedo craft for the government.

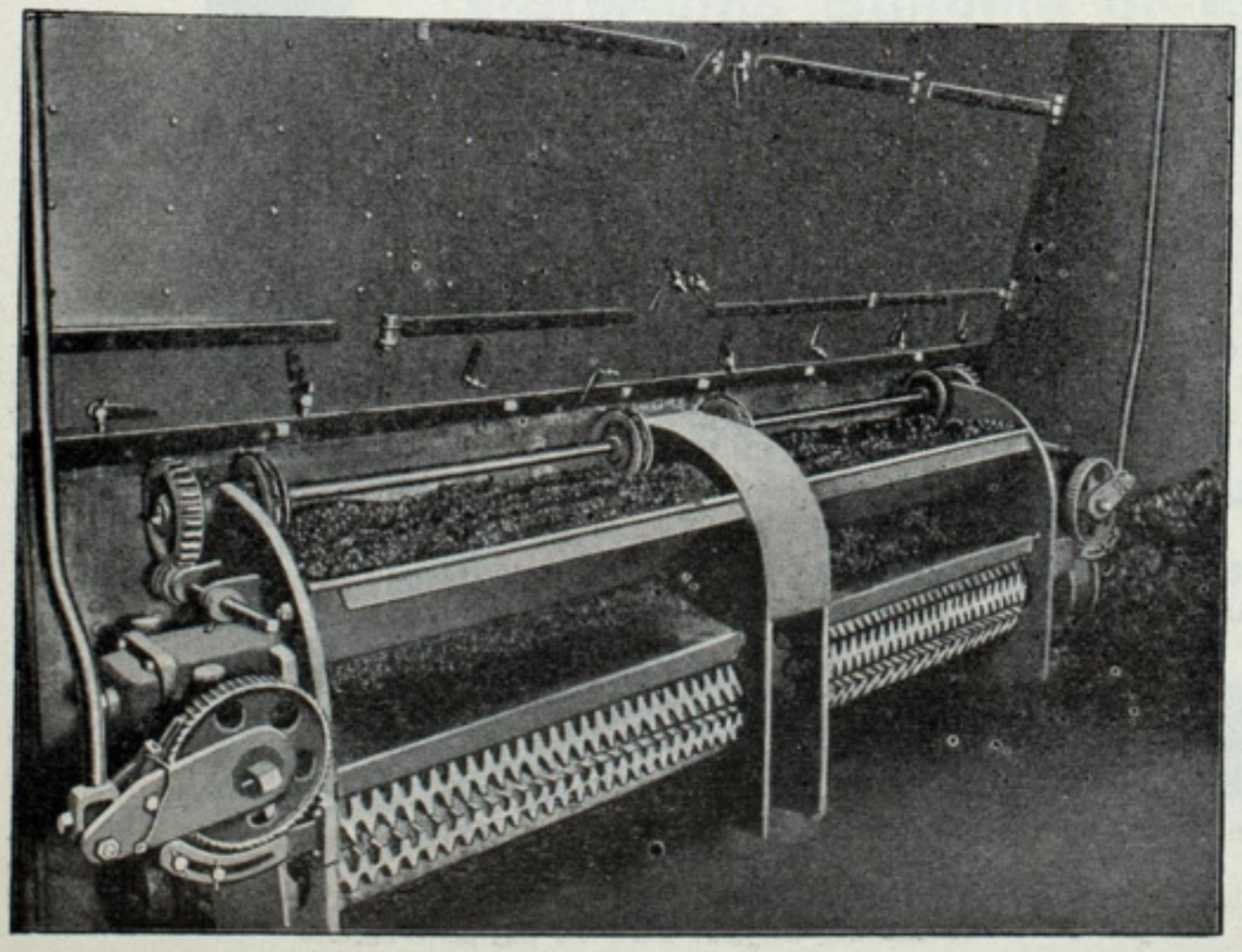
MECHANICAL STOKER ON SHIPBOARD.

On the great lakes, probably more so than in any other part of the world, the mechanical stoker is being developed on shipboard. Some twelve or fourteen freighters of the 6,000-ton kind—vessels fitted with quadruple-expansion engines and Babcock & Wilcox water-tube boilers—have been operating with what is known as the Duluth stoker, made by the Duluth Stoker Co. of Duluth, Minn. This type of stoker will be installed during the present winter in nine similar steamers building at different yards of the American Ship Building Co. It has several times been referred to in these columns. This description is published for the reason that the stoker has been improved steadily since it was first tried on a lake vessel two or three years ago. Of course the Duluth company also makes stokers for stationary plants. One of the illustrations on this page is from a photograph of the installation on the lake steamer James H. Hoyt, a big ore carrier, and represents a small steam engine driving stoker shaft. The other illustration is from a flash-light picture of stokers installed under the port boiler of the same steamer. While the latter picture is not a very good one it is the best to be had at present.

The Duluth stoker consists of an endless belt of grate bars, the bars lying crosswise in the furnace, parallel to each other, and carried by two endless chains, one on each side of the furnace, these chains being of the ordinary type with the exception that the pitch or length of links is somewhat greater than is found in ordinary chains. In the front of the furnace the chains pass over sprockets from which they receive their motion, and at the back end of the stoker they pass over sheaves which are keyed to the shaft, the shaft being carried by dust-proof bearings at either end. To each of these bearings is attached an adjusting screw, which is operated from the rear end of the stoker and which serves the purpose of giving proper tension upon the chains that carry the grate bars. Both the top and bottom members of this chain of grate bars are supported by rollers or fair leaders. The motion of the top member of the grate bars is from the front of the furnace towards the back, and in the front and above the grate bars is placed a hopper for receiving the coal. The motion of the grate bars under the hopper carries in a film or layer of coal upon them, whose thickness is determined by a regulating plate which extends the whole width of the stoker and is adjustable for height, so that the thickness of the fire may be regulated to suit the demands for steam.

At the back end of the stoker and just above the back shaft is placed a water box which serves the purpose of preventing the good fire from falling over the back end of the stoker with the ashes and clinker. The back end of the stoker is adjustable for height, so that the space between grate bars and cross box can be regulated to suit the different size of clinker formed when various kinds of coal are being burned, and its action is as follows: The ashes and clinker pass underneath the cross box, following the motion of the grate bars, while the unconsumed carbon lying on top is held back by the lower edge of the box, effectually closing up this opening and keeping the back end of the furnace covered with good fire, thereby preventing the ingress of cold air, either through the opening between grate bars and cross box or through holes that would otherwise obtain in the fire. The loss of coal down through the grate bars is prevented by placing underneath the bottom member of the chain of grate bars a plate which extends the whole width of the stoker and which catches all the fine coal sifting through the





grate bars, and the grate bars on their return journey to the front of the stoker carry such fine coal along with them, depositing it directly underneath the hopper, into which it can be shoveled as it accumulates. In all marine installations these cross boxes have been made of steel forgings about 6½ in. square, outside measurement, and they have been connected to the boiler so that circulation is positive and reliable, thus forming a part of the heating surface.

The grate bars each have two wrought iron lugs or hooks on their lower edge, which hook into the links of the chains, alternate bars hooking in from opposite sides. The upper faces of the bars are toothed and lock into each other, leaving sufficient opening between them to admit the proper quantities of air to the fire. It is only possible to remove these grate bars while they are passing over the front sprockets, at which time their radial position throws them entirely apart, one from the other; that is, their teeth become disengaged and by a movement of about 1½ in. to right or left, as the grate bar is right-hand or left-hand, they become disengaged from the chain and can be removed. The sprockets on the front shaft of the stoker, which drive the chains, are operated by single worm and worm wheel, the worm being driven by a

ratchet connected to an eccentric rod, the eccentric being carried on a line-shaft placed above stoker. An independent engine is usually installed to drive each line-shaft and from two to six stokers may be driven from any one shaft, as circumstances demand.

In many stoker installations on the lake vessels the engines driving the stokers are placed on brackets secured to the bulkhead between engine room and boiler room, and the line-shaft extends from the boiler room through this bulkhead, its after end carrying a pulley, which receives the engine belt. The boilers are usually two in number, of the Babcock & Wilcox water-tube type, and are placed athwartship with their fronts facing each other, and two stokers are installed in each boiler. The position of engines on the bulkhead is such as to bring them within easy reach of the first engine platform and they are consequently under the care and management of the engine room force. Each boiler with its stoker and engine equipment is a duplicate of the other, and a cross-drive is provided between the two line-shafts in the fire room, so that should either stoker engine become disabled the whole stoker plant could be driven by the remaining engine.

The primary object in placing stokers on these vessels was economy of fuel, and in all marine installations on the lakes a cheap grade of slack coal is being used with them. Reports from the vessels are to the effect that the stokers are producing smokeless combustion. Their economy is said to be due in part to the fact that the heating surfaces are kept free from a soot deposit, rendering them capable of readily absorbing the intense heat generated by the stoker fire. The mechanical movements are also reported as satisfactory and reliable. As the whole stoking operation consists simply in supplying the hoppers with coal and removing the ashes from the rear of the boilers, and as the fires require no poking, slicing or other agitation, with no fire doors to be opened admitting cold air to the furnaces, it would seem that economy should certainly result from their use.

The body of the Duluth stoker is composed almost entirely of structural steel and the best material and workmanship is employed in its construction. The driving gear is enclosed in oil-tight and dust-proof casing, insuring easy working and freedom from destructive wear. The ratchet which drives the worm shaft is supplied with a regulating device, by which the stoker can be stopped instantly without stopping either engine or line-shaft, the same adjustment also permitting of five changes in speed, so that with means to regulate the thickness of the fire upon the grates, and also the speed of the grate bars it would seem possible to meet all requirements for steam.

Jones & La Borde, yacht builders at Oshkosh, Wis., are rushed with work. They have just received an order for a 38-ft. boat for Fred Pabst, Jr., of Milwaukee, Wis. They are also building boats for Robert Nunnemacher of Milwaukee, E. W. Dixon of Omaha and Charles Ross and Frank H. Canbergen of Chicago.

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